(19)日本国特許庁（JP）　(12) 公開特許公報（A）　(11)特許出願公開番号

特開平11－258473

(43)公開日　平成11年(1999) 9月24日

(51)Int.Cl.⁶	識別記号	FI	
G02B　6/44	366	G02B　6/44	366
C08K　5/13		C08K　5/13	
C08L　23/04		C08L　23/04	

審査請求　未請求　請求項の数3　OL　（全 4 頁）

(21)出願番号　特願平10－62400

(22)出願日　平成10年(1998) 3月13日

(71)出願人　000183657
出光石油化学株式会社
東京都港区芝五丁目6番1号

(72)発明者　村上　滋
千葉県市原市姉崎海岸1番地1

(72)発明者　金森　一男
千葉県市原市姉崎海岸1番地1

(74)代理人　弁理士　東平　正道

(54)【発明の名称】　ポリエチレン樹脂組成物及び光ファイバーケーブル用スペーサ

(57)【要約】
【課題】光ファイバーケーブル用スペーサの如き異形押出成形品を剪断速度が１０００ｓｅｃ$^{-1}$以上で高速成形するに適したポリエチレン樹脂組成物を提供する。
【解決手段】特定のメルトフローレート（ＭＦＲ）と密度を有するポリエチレン１００重量部に、
（ａ１）３，５－ジ－ｔ－ブチル－４－ヒドロキシ－トルエンと
（ａ２）テトラキス〔メチレン－３－（３，５－ジ－ｔ－ブチル－４－ヒドロキシフェニル）プロピオネート〕メタンを合計０．０１～１．０重量部、（ただしリン系酸化防止剤との併用を除く。）
（ｂ）滑剤を０．１～１．０重量部
添加してなる異形押出成形用ポリエチレン樹脂組成物。

【特許請求の範囲】

【請求項1】メルトフローレート（MFR）が0．01～1．0g／10分であり、密度が0．958～0．962g／cm³ であるポリエチレン100重量部に、
（a1）3，5－ジ－t－ブチル－4－ヒドロキシトルエンと
（a2）テトラキス〔メチレン－3－（3，5－ジ－t－ブチル－4－ヒドロキシフェニル）プロピオネート〕メタンを9：1～1：9の重量比で合計0．01～1．0重量部、
（b）滑剤を0．1～1．0重量部
配合してなり、リン系酸化防止剤を含有しない異形押出成形用ポリエチレン樹脂組成物。

【請求項2】（b）滑剤が高級脂肪酸金属塩である請求項1に記載のポリエチレン樹脂組成物。

【請求項3】請求項1又は2に記載のポリエチレン樹脂組成物を成形してなる光ファイバーケーブル用スペーサ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、ポリエチレン樹脂組成物および光ファイバーケーブル用スペーサに関する。詳しくは、高速異形押出成形に適したポリエチレン樹脂組成物とそれを成形してなる光ファイバーケーブル用スペーサに関する。

【0002】

【従来の技術】図1に示されるような光ファイバーケーブル用スペーサは、かつて光ファイバーの海底ケーブル用として、鋼鉄製の芯（テンションメンバー）を有する銅又はアルミニウム製のコアの外周面に光ファイバーを収納するための螺旋状スロット（溝）を設けたスペーサが提案され（特開昭56－6206号公報）、これが原型となった。

【0003】以後、コア部分が銅、アルミから架橋ポリエチレン、高密度ポリエチレンに材質変更され（特開昭58－192204号公報）、異形押出成形法により好適な高密度ポリエチレン材料の提案がなされてきた（特開平2－72311号公報、特開平7－333476号公報）。ここで、スペーサの生産性を向上するためには異形押出の成形速度を上げていく必要があるが、従来の2倍の成形速度に相当する剪断速度1000sec⁻¹以上の高速成形条件下ではスペーサの表面に凹凸が表れ、安定して良品が得られない。スペーサの表面凹凸は、すなわちスロットの凹凸となり、スロットに嵌め込んだ光ファイバーは異常に波打つ伝送経路を形成することになるから好ましくない伝送損失の原因となる。このため、高速成形性に優れた成形材料の開発が望まれていた。

【0004】

【発明が解決しようとする課題】本発明は、剪断速度が1000sec⁻¹以上の高速で異形押出成形するに適したポリエチレン樹脂組成物及びそれを成形してなる光ファイバーケーブル用スペーサを提供することを目的とする。

【0005】

【課題を解決するための手段】本発明者らは、上記課題について鋭意検討した結果、特定の樹脂組成物によりこれが解決されることを見出し、以下に示す本発明を完成した。

（1）メルトフローレート（MFR）が0．01～1．0g／10分であり、密度が0．958～0．962g／cm³ であるポリエチレン100重量部に、
（a1）3，5－ジ－t－ブチル－4－ヒドロキシトルエンと
（a2）テトラキス〔メチレン－3－（3，5－ジ－t－ブチル－4－ヒドロキシフェニル）プロピオネート〕メタンを9：1～1：9の重量比で合計0．01～1．0重量部、
（b）滑剤を0．1～1．0重量部
配合してなり、リン系酸化防止剤を含有しない異形押出成形用ポリエチレン樹脂組成物。

（2）（b）滑剤が高級脂肪酸金属塩である上記（1）に記載のポリエチレン樹脂組成物。

（3）上記（1）又は（2）に記載のポリエチレン樹脂組成物を成形してなる光ファイバーケーブル用スペーサ。

【0006】

【発明の実施の形態】以下、本発明について詳細に説明する。

〔A〕ポリエチレン

本発明に用いるポリエチレンのメルトフローレート（MFR：JIS　K7210に準拠して、190℃、2．16kgfで測定した値）は0．01～1．0g／10分であり、密度（MFR測定時に得られるストランドを120℃で1時間熱処理し、1時間かけて室温まで徐冷した後、密度勾配管で測定した値）は0．958～0．962g／cm³ である。MFRが0．01g／10分より小さければ押し出し成形が不可能であり、1．0g／10分を超えればリブ形状の保持性に問題が発生する。又、密度が0．958g／cm³ より小さければ剛性が不充分であり、0．962g／cm³ を超えれば表面平滑性が悪化する。上記のポリエチレンは、高密度ポリエチレンと呼ばれ、公知の製造法で、例えばマグネシウム担持型ハロゲン化チタンと有機アルミ化合物からなるチーグラー系触媒を用いてエチレンを重合させることにより得られる。

【0007】〔B〕添加剤

本発明では、上記ポリエチレン100重量部に
（a1）3，5－ジ－t－ブチル－4－ヒドロキシトルエンと
（a2）テトラキス〔メチレン－3－（3，5－ジ－t

－ブチル－４－ヒドロキシフェニル）プロピオネート〕メタンを９：１～１：９の重量比で合計０．０１～１．０重量部配合する。

【０００８】上記化合物は、フェノール系酸化防止剤の一種であるが、両者を併用することにより特に高剪断領域（剪断速度：１０００ｓｅｃ$^{-1}$以上）で表面粗さの増大を抑制する相乗効果が得られる。なお、さらにこれにリン系酸化防止剤を併用すると、むしろ高剪断領域での表面粗さが著しく増加し、好ましくない。上記両化合物の使用割合（重量比）が上記範囲を外れると併用効果が発揮しえない。更に、それら両化合物の合計添加量が０．０１重量部より少なければ、表面粗さを抑える効果が見られなくなり、１．０重量部を超えては、添加効果の向上が見られない。

【０００９】なお、本発明においては他のフェノール系酸化防止剤をさらに配合することも可能でありその例としては、２，２’－メチレンビス（４－メチル－６－ｔ－ブチルフェノール）、４，４’－チオビス（３－メチル－６－ｔ－ブチルフェノール）、４，４’－ブチリデンビス（３－メチル－６－ｔ－ブチルフェノール）、１，１，３－トリス（２－メチル－４－ヒドロキシ－５－ｔ－ブチルフェニル）ブタン、１，３，５－トリメチル－２，４，６－トリス（３，５－ジ－ｔ－ブチル－４－ヒドロキシベンジル）ベンゼン等がある。なお、本発明で使用を避けるべきリン系酸化防止剤としては、フェニルジイソデシルホスファイト、ジフェニルイソデシルホスファイト、ジフェニルトリデシルホスファイト、トリフェニルホスファイト、トリス（ノニルフェニル）ホスファイト等がある。

【００１０】〔Ｃ〕滑剤

本発明の高速異形押出成形用ポリエチレン樹脂組成物には、上記添加剤のほかに特にその高速成形安定性を増大させるために滑剤が用いられる。本発明に用いる滑剤としては、流動パラフィン、ポリエチレンワックス等炭化水素系滑剤、高級脂肪酸、オキシ脂肪酸等脂肪酸系滑剤、脂肪酸アミド、ビス脂肪酸アミド等脂肪酸アミド系滑剤、金属石けん系滑剤、単純エステル、グリセリド等エステル系滑剤、アルコール系滑剤等各種の滑剤を用いることができる。中でも金属石けん系滑剤である高級脂肪酸金属塩を好適に用いることができる。具体的には、ステアリン酸亜鉛、ステアリン酸マグネシウム等のステアリン酸金属塩、ラウリン酸亜鉛等を挙げることができる。これらのものの中で、ステアリン酸金属塩、特にステアリン酸カルシウムを好適に用いることができる。本発明において、上記ポリエチレン樹脂１００重量部に滑剤を０．１～１．０重量部、より好ましくは０．２～０．７重量部配合する。なお、滑剤の添加量が０．１重量部より少なければ、押出機での成形速度を上げられない場合があり、１重量部より多くしては成形中に滑剤の析出（白粉）が目立ってくる一方、添加効果の向上が見られなくなる。

【００１１】〔Ｄ〕異形押出成形

異形押出成形法は、一般的には押出機の先端部に、やや複雑な断面形状を有する押出成形品を作るためのダイスを設け、押出機で可塑化した樹脂をこのダイスを通して押出し、溶融樹脂を冷却固化することにより成形する方法である。押出機としては、単軸、二軸押出機等が用いられ、ダイスは、用いる樹脂の種類、成形物の断面形状によって、これまでの知見からダイス出口形状の寸法、ランドの長さ、角度、内面の粗さ等が決定され、冷却方法としては、水冷法等が採用される。又、本発明は共押出、発泡押出等をする場合にも適用される。本発明の異形押出用ポリエチレン樹脂組成物の成形により、図１に示すような光ファイバーケーブル用スペーサが好適に得られる。

【００１２】なお、本発明の樹脂組成物は剪断速度が１０００ｓｅｃ$^{-1}$以上の高剪断領域において特にその効果が著しいものであるが、異形押出機の押出流量から剪断速度を簡便に求める方法を下記に示す。

Ｑ：流量　（ｃｍ^3 ／ｓｅｃ）

γ：剪断速度（ｓｅｃ$^{-1}$）

ｒ１：芯（テンションメンバー）外径×１／２（ｃｍ）

ｒ２：コア外径（円柱近似）×１／２（ｃｍ）

として、

$\gamma = 6Q / \pi (r2 + r1)(r2 - r1)$

で求めることができる。

【００１３】

【実施例】本発明について、更に、実施例を用いて詳細に説明する。

〔実施例１〕５０ｍｍφ押出機に光ファイバーケーブル用スペーサ成形用ダイス（回転ダイス）をセットして、外径が８．５ｍｍφのコア（外径２．６ｍｍφの鋼線が芯材に用いられ、又コアの周囲に４条のらせん溝が形成される）を以下の成形材料を用いて、溶融樹脂の剪断速度が３００ｓｅｃ$^{-1}$、６００ｓｅｃ$^{-1}$、１２００ｓｅｃ$^{-1}$になる押出速度で成形した。

【００１４】成形材料は、高密度ポリエチレン（ＭＦＲ＝０．１８ｇ／１０分、密度＝０．９５９ｇ／ｃｍ^3 ）で出光石油化学製のＩＤＥＭＩＴＳＵ　ＨＤＰＥ　５４０ＥＸを１００ｋｇ、添加剤３，５－ジ－ｔ－ブチル－４－ヒドロキシ－トルエン（吉富ファインケミカル製ＢＨＴ）０．０３ｋｇ　、テトラキス〔メチレン－３－（３，５－ジ－ｔ－ブチル－４－ヒドロキシフェニル）プロピオネート〕メタン（チバスペシャリティケミカルズ製イルガノックス１０１０）０．０５ｋｇ、滑剤としてステアリン酸カルシウム０．２５ｋｇを配合して用いた。成形品スペーサの平均表面粗さＲａを表面粗さ計小坂研究所製ＳＥ－３０Ｄ（ＪＩＳ　Ｂ　０６０１による）により測定し、その結果を図２に示す。

【００１５】〔比較例１〕実施例１において、成形材料

の添加剤をテトラキス〔メチレン－３－（３，５－ジ－ｔ－ブチル－４－ヒドロキシフェニル）プロピオネート〕メタン（チバスペシャリティケミカルズ製イルガノックス１０１０）０．１ｋｇ、トリス（２、４－ジ－ｔ－ブチルフェニル）フォスファイト（チバスペシャリティケミカルズ製イルガフォス１６８）０．１５ｋｇに変えた以外は同一の成形材料を用いて、同様に成形し、評価した。その結果を図２に示す。

【００１６】

【発明の効果】図からも理解されるように、本発明によると剪断速度領域が１０００ｓｅｃ$^{-1}$を超える領域に入ると、通常の酸化防止剤を使用した場合に較べた表面粗さの差はより大きく且つ明確に現れる。

【図面の簡単な説明】

【図１】典型的な光ファイバーケーブル用スペーサの構造を示す概略図

【図２】実施例及び比較例における表面粗さの剪断速度依存性評価を示すグラフ

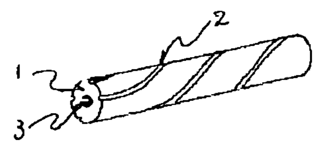
【符号の説明】

１：コア

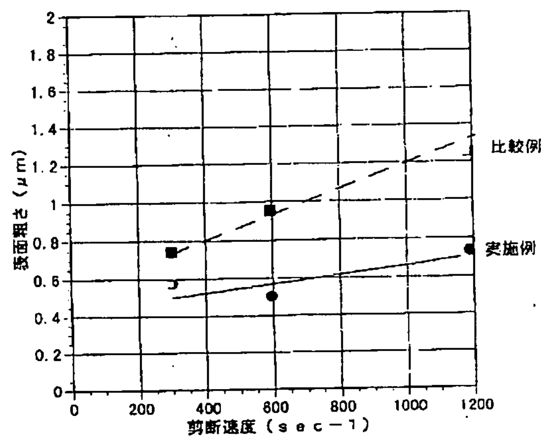
２：スロット（溝）

３：芯（テンションメンバー）

【図１】



【図２】



CLAIMS

[Claim(s)]

[Claim 1] A pixel detection means to be the image processing system which extracts the background image which is an image of the background from a series of images, and to detect the pixel which is in the same location spatially where alignment of the background of each of that screen is performed from said a series of images, The number means of call meters which carries out counting of the frequency of the pixel value of said pixel which is in the same location spatially, A background-image storage means by which the rate of said frequency to the number of said pixel which is in the same location spatially memorizes the pixel value beyond a predetermined value as a pixel value of the background pixel which constitutes said background image, The image processing system characterized by including a background escape means to extend said background image memorized by said background-image storage means, based on said background pixel the pixel value was remembered to be.

[Claim 2] Said background-image storage means is an image processing system according to claim 1 with which said rate of the highest frequency of a pixel value is characterized by memorizing the pixel value beyond said predetermined value as a pixel value of the background pixel which constitutes said background image.

[Claim 3] Said background escape means is an image processing system according to claim 1 characterized by calculating the pixel value of said background pixel the pixel value is not remembered to be based on said background pixel the pixel value close to it is remembered to be, and writing in said background-image storage means.

[Claim 4] Said background escape means is an image processing system according to claim 1 characterized by calculating the pixel value of the background [of not registering] pixel which is said background pixel the pixel value is not remembered to be based on a continuity with the background [of having registered] pixel which is said background pixel the pixel value close to it is remembered to be, and writing in said background-image storage means.

[Claim 5] The pixel value which has the rate of the frequency of the pixel value of said background [of not registering] pixel, and the pixel of said a series of images which a space target has in the same location in predetermined ranking said background escape means When it has the pixel value and continuity of said background [of having registered] pixel which adjoin said background [of not registering] pixel, The image processing system according to claim 4 characterized by for the rate of said

frequency of having the pixel value and continuity of said background [of having registered] pixel calculating the pixel value of said background [of not registering] pixel, and writing in said background-image storage means based on the pixel value which is within predetermined order.

[Claim 6] The pixel detection step which is the image-processing approach of extracting the background image which is an image of the background from a series of images, and detects the pixel which is in the same location spatially where alignment of the background of each of that screen is performed from said a series of images, The number step of call meters which carries out counting of the frequency of the pixel value of said pixel which is in the same location spatially, The rate of said frequency to the number of said pixel which is in the same location spatially the pixel value beyond a predetermined value as a pixel value of the background pixel which constitutes said background image The image-processing approach characterized by including the background-image storage step which a background-image storage means to memorize said background image is made to memorize, and the background escape step which extends said background image memorized by said background-image storage means based on said background pixel the pixel value was remembered to be.

[Claim 7] The program for performing the image processing which extracts the background image which is an image of the background from a series of images The pixel detection step which is the medium which a computer is made to perform and detects the pixel which is in the same location spatially from said a series of images where alignment of the background of each of that screen is performed, The number step of call meters which carries out counting of the frequency of the pixel value of said pixel which is in the same location spatially, The rate of said frequency to the number of said pixel which is in the same location spatially the pixel value beyond a predetermined value as a pixel value of the background pixel which constitutes said background image The background-image storage step which a background-image storage means to memorize said background image is made to memorize, The medium which makes said computer execute the program characterized by including the background escape step which extends said background image memorized by said background-image storage means based on said background pixel the pixel value was remembered to be.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a medium at the image processing system and the image-processing approach of enabling it to extract the background especially displayed on the image processing system and the image-processing approach, and the list by a series of images about the medium with a sufficient precision, and a list.
[0002]
[Description of the Prior Art] Conventionally, it considers as the approach of carrying out compression coding of the image, for example, there is object coding. In object coding, the foreground and background are extracted from a series of images (one scene or image of 1 cut) (for example, frame from a certain scene change to the next scene change etc.). That is, when a series of images consist of N frames, the background (in a video camera, if this background is panning or the scene photoed by carrying out chill TINGU, it will serve as an oblong or longwise image) of the whole 1 scene displayed with that N frame, and the foreground which exists in common in the N frame are extracted. And decode of the data obtained by object coding is performed by arranging a foreground for a background.
[0003]
[Problem(s) to be Solved by the Invention] By the way, in coding which extracts a foreground and a background, the precision which extracts a background influences the image quality of the decode image greatly like above-mentioned object coding, for example.
[0004] This invention is made in view of such a situation, and enables it to extract a background with a sufficient precision from a series of images.
[0005]
[Means for Solving the Problem] A pixel detection means by which the image processing system of this invention detects the pixel which is in the same location spatially from a series of images where alignment of the background of each of that screen is performed, The number means of call meters which carries out counting of the frequency of the pixel value of the pixel which is in the same location spatially, A background-image storage means by which the rate of frequency to the number of the pixel which is in the same location spatially memorizes the pixel value beyond a predetermined value as a pixel value of the background pixel which constitutes a background image, It is characterized by including a background escape means to extend the background image memorized by the background-image storage means, based on the background pixel the

pixel value was remembered to be.

[0006] The rate of the highest frequency of a pixel value can make a background-image storage means memorize the pixel value beyond a predetermined value as a pixel value of the background pixel which constitutes a background image.

[0007] A background escape means can be made to be asked for the pixel value of the background pixel the pixel value is not remembered to be based on the background pixel close to it the pixel value is remembered to be, and it can be made to write in a background-image storage means. Moreover, a background escape means can be made to be asked for the pixel value of the background [of not registering] pixel which is a background pixel the pixel value is not remembered to be based on a continuity with the background [of having registered] pixel close to it which is a background pixel the pixel value is remembered to be, and it can be made to write in a background-image storage means. For a background escape means, furthermore, the pixel value which has the rate of the frequency of the pixel value of a background [of not registering] pixel, and the pixel of a series of images which a space target has in the same location in predetermined ranking When it has the pixel value and continuity of a background [of having registered] pixel which adjoin a background [of not registering] pixel, the pixel value of a background [of not registering] pixel can be made to be calculated, and it can be made to write in a background-image storage means based on the pixel value which has the pixel value and continuity of a background [of having registered] pixel and which has the rate of frequency within predetermined order.

[0008] The pixel detection step to which the image-processing approach of this invention detects the pixel which is in the same location spatially from a series of images where alignment of the background of each of that screen is performed, The number step of call meters which carries out counting of the frequency of the pixel value of the pixel which is in the same location spatially, The rate of frequency to the number of the pixel which is in the same location spatially the pixel value beyond a predetermined value as a pixel value of the background pixel which constitutes a background image It is characterized by including the background-image storage step which a background-image storage means to memorize a background image is made to memorize, and the background escape step which extends the background image memorized by the background-image storage means based on the background pixel the pixel value was remembered to be.

[0009] The program which the medium of this invention makes a computer execute The pixel detection step which detects the pixel which is in the same location spatially from a series of images where alignment of the background of each of that screen is

performed, The number step of call meters which carries out counting of the frequency of the pixel value of the pixel which is in the same location spatially, The rate of frequency to the number of the pixel which is in the same location spatially the pixel value beyond a predetermined value as a pixel value of the background pixel which constitutes a background image It is characterized by including the background-image storage step which a background-image storage means to memorize a background image is made to memorize, and the background escape step which extends the background image memorized by the background-image storage means based on the background pixel the pixel value was remembered to be.

[0010] The pixel which is in the same location spatially where alignment of the background of each of that screen is performed in the image processing system of this invention and the image-processing approach, and a list from a series of images in a medium is detected, and counting of the frequency of the pixel value of the pixel which is in the same location spatially is carried out. And based on the background pixel the rate of frequency to the number of the pixel which is in the same location spatially was remembered to be by background-image storage means to memorize a background image, as a pixel value of the background pixel from which the pixel value beyond a predetermined value constitutes a background image, and the pixel value was remembered to be, the background image memorized by the background-image storage means is extended.

[0011]

[Embodiment of the Invention] Drawing 1 shows the example of a configuration of the gestalt of 1 operation of the image transmission equipment which applied this invention.

[0012] The digital image data as an image (here, it considers as a dynamic image) set as the object of coding photoed with the video camera etc. are supplied, the image is encoded by the encoder 1 and the coded data obtained as a result is outputted to it there. This coded data is transmitted through the transmission media 3, such as a satellite circuit, and a ground wave, a CATV (Cable Television) network, the Internet, ISDN (Integrated Service Digital Network), or is recorded on the record media 4, such as an optical disk, and a magneto-optic disk, a magnetic disk, a magnetic tape, a phase change disk.

[0013] The coded data transmitted through a transmission medium 3 or the coded data reproduced from a record medium 4 is supplied to a decoder 2, in a decoder 2, the coded data supplied there is decoded, and the decode image obtained as a result is supplied and displayed on the monitor which is not illustrated, for example.

[0014] The above image transmission equipment is applicable to the equipment which

transmits and receives an image in the distant location, for example, the equipment which performs record playback of an image.

[0015] Next, drawing 2 shows the example of a configuration of the encoder 1 of drawing 1 .

[0016] The are recording section 11 consists of semiconductor memory, a magnetic disk, etc., and stores temporarily the image data supplied to an encoder 1. Here, image data is inputted and memorized by the are recording section 11, for example per frame of a series of images, such as from a certain scene change until [of a degree] a scene change. In addition, as shown in drawing 3 , the image data of the N frame which becomes by the 1st frame thru/or the Nth frame shall be memorized by the are recording section 11 as a series of images here, for example.

[0017] If the image of the N frame as a series of images is memorized by the are recording section 11, the camera motion detecting element 12 will read the image of the N frame from the are recording section 11, and will detect the camera motion vector showing the direction and magnitude of a camera motion in each frame.

[0018] That is, the camera motion detecting element 12 sets the camera motion vector v1 of the 1st frame as 0 (= (0 0)) in the system of coordinates (suitably henceforth standard coordinates) which make the right or down [a top to] a x axis or the y-axis from the left, respectively while making a zero the point at the upper left of the 1st frame, as shown in drawing 4 (A). And about the 2nd frame thru/or the Nth frame, the camera motion detecting element 12 searches for the coordinate (x y) of the criteria seat table system in which the point at the upper left of the n-th frame is located as the camera motion vector vn of the n-th frame, when alignment of the background of each frame is performed.

[0019] After the camera motion detecting element 12 sets the camera motion vector v1 of the 1st frame as 0, as shown in drawing 4 (B), in standard coordinates, it asks for the location of the 1st frame and the 2nd frame whose backgrounds correspond, and, specifically, searches for the coordinate of the point at the upper left of [in the location] the 2nd frame as the camera motion vector v2. Furthermore, as shown in drawing 4 (C), in standard coordinates, the camera motion detecting element 12 asks for the location of the 1st frame which performed alignment of a background and the 2nd frame, and the 3rd frame whose backgrounds correspond, and searches for the coordinate of the point at the upper left of [in the location] the 3rd frame as the camera motion vector v3.

[0020] Hereafter, the camera motion detecting element 12 calculates the camera motion vector v4 of the 4th frame thru/or the Nth frame thru/or vN similarly.

[0021] In addition, in order to simplify explanation, as a camera motion, only a motion

of a perpendicular direction is considered and let revolutions be level and the thing which is not considered here. However, this invention can be applied even when a camera motion has a revolution.

[0022] The camera motion vector v1 of the 1st frame thru/or the Nth frame as a series of images detected by the camera motion detecting element 12 as mentioned above thru/or vN are supplied to the camera motion vector storage section 13, and is memorized.

[0023] When the camera motion vector v1 thru/or vN are memorized, in the camera motion vector storage section 13 the background extract section 14 While reading the camera motion vector v1 thru/or vN from the camera motion vector storage section 13 Read the image data of the 1st frame thru/or the Nth frame from the are recording section 11, and by performing alignment of the background of the 1st frame thru/or the Nth frame based on the camera motion vector v1 thru/or vN the 1st frame thru/or that the Nth frame background of the whole (this background -- for example, a series of images -- a video camera -- panning -- or if chill TINGU is carried out and a photograph is taken, it will become an oblong or longwise image) (suitably henceforth a whole background) are extracted. The whole background extracted in the background extract section 14 is supplied to the background memory 15, and is memorized.

[0024] In the background memory 15, if a whole background is memorized, the foreground coding section 16 detects the background of each frame memorized by the are recording section 11 among the whole background based on the camera motion vector of each frame memorized by the camera motion vector storage section 13, will be subtracting the background of each of that detected frame from the image of each frame, and will extract the foreground of each frame. Furthermore, the foreground coding section 16 encodes the foreground of each frame, and outputs the coding result to MUX(multiplexer) 17.

[0025] From the foreground coding section 16, if the coding result of a foreground is received, MUX17 will multiplex the camera motion vector memorized by the camera motion vector storage section 13 and the whole background memorized by the background memory 15 to the coding result of the foreground, and will output the multiplexing result to it as coded data.

[0026] In an encoder 1, image data is encoded per a series of images as mentioned above.

[0027] Next, drawing 5 shows the example of a configuration of the camera motion detecting element 12 of drawing 2 .

[0028] A series of images memorized by the are recording section 11 (drawing 2) are supplied to the center-of-gravity calculation section 21 per frame, and the center-of-gravity calculation section 21 asks it for a center of gravity which is later

mentioned about each frame. Furthermore, the center-of-gravity calculation section 21 sets up the range (suitably henceforth the motion detection range) used for detecting the camera motion vector of the attention frame currently observed to the are recording image mentioned later memorized in the are recording image memory 24, and also searches for the center of gravity of the motion detection range. The center of gravity of the attention frame called for in the center-of-gravity calculation section 21 and the motion detection range is supplied to the vector detecting element 22.

[0029] The vector detecting element 22 is supplied to the write-in control section 23 while it detects the camera motion vector of an attention frame and supplies it to the camera motion vector storage section 13 (drawing 2) based on the center of gravity of the attention frame supplied from the center-of-gravity calculation section 21, and the motion detection range.

[0030] The write-in control section 23 controls the address with which the are recording image memory 24 memorizes the image data of an attention frame based on the camera motion vector from the vector detecting element 22. From the are recording section 11 (drawing 2), the are recording image memory 24 reads the image data of an attention frame, and memorizes it to the address specified by the write-in control section 23.

[0031] Next, with reference to drawing 6 , the camera motion detection processing performed in the camera motion detecting element 12 of drawing 5 in which a camera motion vector is detected is explained.

[0032] The point at the upper left of [in the condition of having performed alignment of each frame and having performed the alignment] each frame is detected as a camera motion vector of each frame so that the center of gravity of each frame may be in agreement fundamentally paying attention to the center of gravity of an image moving the camera motion detection processing which the camera motion detecting element 12 performs by camera motion.

[0033] That is, if the n-th frame is now used as an attention frame, the image in the condition of having performed alignment of the background of each frame in the are recording image memory 24, and having laid the 1st thru/or the image data of the n-1st frame which is a frame to the frame in front of an attention frame on top of it in the sequence (are recording image) is memorized.

[0034] In this case, the center-of-gravity calculation section 21 searches for the center of gravity cn of the n-th frame which is an attention frame, as shown in drawing 6 (A). Furthermore, as shown in drawing 6 (B), the center-of-gravity calculation section 21 makes the range which includes the n-1st frame in front of one of the attention frames in the are recording image memorized in the are recording image memory 24 the motion

detection range, and searches for the center of gravity c of the motion detection range. Here, as motion detection range, the range where only the predetermined number of pixels is large is set up in each direction of four directions of the n-1st frame, for example.

[0035] By the vector detecting element 22, if the center of gravity cn of an attention frame and the center of gravity c of the motion detection range are searched for, as shown in drawing 6 (C), the location of the point at the upper left of [in the condition that the center of gravity cn of an attention frame was in agreement with the center of gravity c of the motion detection range] an attention frame will be called for, and the coordinate of the location will be outputted as a camera motion vector vn of the n-th frame which is an attention frame.

[0036] That is, considering the n-th frame as an attention frame, in asking for the camera motion vector vn, it has already found the camera motion vector of a before [one of them]. Then, as shown in drawing 6 (C), while expressing the location on the basis of the point at the upper left of [of the center of gravity c of the motion detection range] the n-1st frame with vector v'c Supposing it expresses with vector v'cn the location on the basis of the point at the upper left of [of the center of gravity cn of the n-th frame which is an attention frame / the] the n-th frame The coordinate in the standard coordinates of the location of the point at the upper left of [in the condition that the center of gravity c of the motion detection range and the center of gravity cn of an attention frame were in agreement] an attention frame serves as the motion vector vn of an attention frame. And it can ask for this camera motion vector vn by subtracting vector v'cn which adds vector v'c showing the location of the center of gravity c of the motion detection range to motion vector vn-1 in front of one attention frame of the n-1st frame, and expresses the location of the center of gravity cn of an attention frame to it further. That is, it can ask for the camera motion vector vn of an attention frame by calculating formula vn=vn-1+v'c-v'cn.

[0037] After the camera motion vector vn of an attention frame is called for as mentioned above, in the write-in control section 23, the write-in address for writing in the image data of the attention frame in the are recording image memory 24 is controlled based on the camera motion vector vn. Namely, thereby, in standard coordinates, the image data of an attention frame is written in the point shown by the camera motion vector vn in the form to overwrite, and the image obtained as a result of the writing is used for it by using the following frame [n+1st] as an attention frame in the are recording image memory 24 as an are recording image at the time of detecting the camera motion vector vn+1 so that the point of the upper left may be located.

[0038] Next, with reference to the flow chart of drawing 7 , the camera motion detection processing in the camera motion detecting element 12 of drawing 5 is explained further.
[0039] While reading appearance of the 1st frame of a series of images memorized by the are recording section 11 is carried out as an attention frame and it is first supplied to the center-of-gravity calculation section 21, the storage value of the are recording image memory 24 is cleared.
[0040] And in the center-of-gravity calculation section 21, it is judged in step S1 whether there is any 1st attention frame. In step S1, when judged with there being the 1st attention frame, it progresses to step S2, and the vector detecting element 22 sets up 0 as the camera motion vector v1, outputs it to the camera motion vector storage section 13 and the write-in control section 23, and progresses to step S6.
[0041] Based on the camera motion vector from the vector detecting element 22, the write-in control section 23 controls the write-in address in the are recording image memory 24 by step S6, and, thereby, writes an attention frame in the are recording image memory 24 at it. That is, in now, there is the 1st attention frame, and since the camera motion vector v1 is 0, the image data of the 1st frame is written in in the are recording image memory 24 so that the point of the upper left may be located in the zero in standard coordinates.
[0042] Then, it progresses to step S7, and when judged with it being judged whether there is any following frame which constitutes a series of images, and occurring by the are recording section 11, reading appearance of the following frame is newly carried out to it as an attention frame, and it is supplied to it at the center-of-gravity calculation section 21. And the same processing is repeated by step S1 return and the following.
[0043] When it is judged with there not being the 1st attention frame in step S1 on the other hand (i.e., when it is either the 2nd frame or thru/or the Nth frame), it progresses to step S3, and in the center-of-gravity calculation section 21, center-of-gravity calculation processing in which the center of gravity of an attention frame is searched for is performed, and it progresses to step S4. In step S4, in the center-of-gravity calculation section 21, the motion detection range to an attention frame is set up into the are recording image memorized in the are recording image memory 24, center-of-gravity calculation processing in which the center of gravity of the motion detection range is searched for is performed, and it progresses to step S5.
[0044] At step S5, in the vector detecting element 22, as drawing 6 explained, the camera motion vector of an attention frame is called for, and it is outputted to the camera motion vector storage section 13 and the write-in control section 23 from the center of gravity of the attention frame called for in the center-of-gravity calculation

section 21, and the center of gravity of the motion detection range.

[0045] And as progressed and mentioned above to step S6, in the write-in control section 23, based on the camera motion vector from the vector detecting element 22, the write-in address in the are recording image memory 24 is controlled, and, thereby, an attention frame is written in the are recording image memory 24. That is, in the are recording image memory 24, in standard coordinates, the image data of an attention frame is written in the point shown by the camera motion vector of an attention frame so that the point of the upper left may be located (overwritten).

[0046] Then, as progressed and mentioned above to step S7, when it is judged whether the following frame which constitutes a series of images is in the are recording section 11 and it is judged with there being nothing (i.e., when the 1st which constitutes a series of images thru/or the camera motion vector of each Nth frame are called for), camera motion detection processing is ended.

[0047] Next, with reference to the flow chart of drawing 8 , the processing (center-of-gravity calculation processing of an attention frame) which the center-of-gravity calculation section 21 performs is explained in full detail in step S3 of drawing 7 .

[0048] First, in step S11, to Variables X or Y, the number of pixels beside an attention frame (horizontal direction) or the vertical (perpendicular direction) number of pixels is set, respectively, and progresses to step S12.

[0049] -1 as initial value is set to the variable y which expresses the y-coordinate of each pixel of an attention frame with step S12, it progresses to step S22, and the increment of the variable y is carried out only for 1.

[0050] Here, the coordinate of each pixel which constitutes an attention frame makes the pixel on the leftmost a zero, shall take a x axis or the y-axis from the left from a top to the right or down, respectively, and shall express it.

[0051] Then, it progresses to step S14 and it is judged whether Variable y is under the number Y of pixels of the length of an attention frame. In step S14, when judged with Variable y being under Y, it progresses to step S15, and -1 as initial value is set to the variable x showing the x-coordinate of each pixel of an attention frame, and it progresses to step S16.

[0052] At step S16, the increment only of 1 is carried out, Variable x progresses to step S17, and it is judged whether Variable x is under the number X of pixels beside an attention frame. In step S17, when judged with Variable x not being under X, the same processing is repeated by step S13 return and the following.

[0053] Moreover, in step S17, when judged with Variable x being under X, it progresses

to step S18, the pixel p (x y) in a coordinate (x y) is made into an attention pixel, and the attention pixel is classified into either of the level set up beforehand based on the pixel value.

[0054] That is, with the gestalt of this operation, the range of the value which can be taken as a pixel value is beforehand divided into some range. And if the range of the value which can be taken as a now, for example, pixel, value shall be divided into K range and this K range shall be called level 1, 2, ..., K in an order from the range where a pixel value is small, at step S18, an attention pixel will be classified according to whether a pixel value belongs to level 1 thru/or which range of the K.

[0055] Furthermore, the level classification result of an attention pixel is registered into a level table at step S18.

[0056] The center-of-gravity calculation section 21 Namely, among those, the frequency fk of the pixel which belongs to the memory (not shown) to harbor at the level k about each level k (k= 1, 2, ..., K) as shown in drawing 9 , When the level table which matched integrated value sigmaxk of the x-coordinate of the pixel belonging to level k and integrated value sigmayk of a y-coordinate is memorized, for example, the pixel value of an attention pixel belongs to level k While only 1 increments the frequency fk about the level k in a level table, the x-coordinate or y-coordinate of an attention pixel is added to integrated value sigmaxk of an x-coordinate, or integrated value sigmayk of a y-coordinate, respectively.

[0057] In addition, a level table is cleared by 0 whenever processing according to the flow chart of drawing 8 is started.

[0058] And the same processing is repeated by step S16 return and the following.

[0059] It processes by making into an attention pixel each pixel which constitutes an attention frame on the other hand when judged with Variable y not being under Y in step S14, and when all the pixels that constitute an attention frame are registered into a level table, it progresses to step S19 and the center of gravity of the pixel belonging to each level of a level table is searched for. That is, the coordinate (sigmaxk/fk, sigmayk/fk) as which the division of integrated value sigmaxk of the x-coordinate in each level k of a level table or each integrated value sigmayk of a y-coordinate is done in the frequency fk, and it is expressed in step S19 with the division value is searched for as a center of gravity of the pixel belonging to each level k.

[0060] and the step S20 -- progressing -- level 1 thru/or K -- it is alike, respectively, and the center of gravity of the center of gravity of the pixel which belongs is searched for as a center of gravity of the whole pixel which constitutes an attention frame, and carries out a return.

[0061] namely, -- step S20 -- level 1 thru/or K -- it is alike, respectively, and the weighting average which makes weight the frequency f1 thru/or fK is calculated about the center of gravity of the pixel which belongs, and it is outputted as a center of gravity of the whole pixel where the weighting average constitutes an attention frame.
[0062] Next, with reference to the flow chart of drawing 10 , the processing (center-of-gravity calculation processing of the motion detection range) which the center-of-gravity calculation section 21 performs is explained in full detail in step S4 of drawing 7 .
[0063] First, the motion detection range is set up in step S31. That is, at step S31, the range where the frame in front of one attention frame was written in is detected from the are recording image memorized in the are recording image memory 24. Furthermore, at step S31, the detected range can extend only the predetermined number of pixels for example, in the direction of four directions, respectively, and the range which was able to be extended is set up as motion detection range.
[0064] And it progresses to step S32, and to Variables X or Y, the number of pixels beside the motion detection range or the vertical number of pixels is set, respectively, and progresses to step S33.
[0065] Then, in step S33 thru/or S41, step S12 of drawing 8 thru/or the respectively same processing as the case in S20 are performed, and thereby, the center of gravity of the whole pixel which constitutes the motion detection range is searched for, and carries out a return.
[0066] In the camera motion detecting element 12, the predetermined range containing the frame in front of one of the attention frames in an are recording image is set up as motion detection range. As mentioned above, the center of gravity of the motion detection range, Since the center of gravity of an attention frame is computed, and it asks for the camera motion vector of an attention frame based on those centers of gravity and was made to repeat writing an attention frame in an are recording image based on the camera motion vector As compared with the case where the so-called block matching is performed, it can ask for a camera motion vector simply.
[0067] In addition, although the center of gravity of an attention frame is searched for and the center of gravity of the motion detection range was searched for in step S4 after that in step S3 with the gestalt of operation of drawing 7 , you may ask for whichever first and the center of gravity of an attention frame and the center of gravity of the motion detection range can also be made to ask simultaneously.
[0068] Next, although it asked for each pixel which constitutes the attention frame for the center of gravity of an attention frame with the gestalt of operation of drawing 8 by

classifying into either of some level according to the pixel value (suitably henceforth a level classification) In addition to this, the center of gravity of an attention frame for example, each pixel which constitutes the attention frame It is also possible to carry out based on some pixels (for self to be included and for it not to be necessary to include) around it by classifying into either of some classes (suitably henceforth a class classification).

[0069] Here, a class classification is explained briefly. A now, for example, attention, pixel shall constitute the tap (suitably henceforth a class tap) used for the class classification of an attention pixel from the 4 pixels which adjoins vertically and horizontally, respectively, and own a total of 5 pixels of an attention pixel. If a pixel value shall be expressed by 1 bit in this case (it becomes the value of either 0 or 1), an attention pixel can be classified into the pattern of 32 (= (21) 5) according to the pixel value which 5 pixels of the class tap constituted about that attention pixel can take. It is such a pattern part injury class classification, and an attention pixel will be classified into either of the classes of 32 when it is now.

[0070] In addition, if the class tap which becomes by 5 pixels as mentioned above is constituted and a class classification is generally performed when 8 bits is assigned to the pixel although about 8 bits is assigned to a pixel, the number of classes will turn into a huge number called (28) 5.

[0071] Then, to the class tap constituted about an attention pixel, L bit ADRC (Adaptive Dynamic Range Coding) processing is carried out, and a class classification can be performed based on the class tap after the ADRC processing.

[0072] Here, in L bit ADRC processing, for example, Maximum MAX and the minimum value MIN of a pixel value of a pixel which constitute a class tap are detected, DR=MAX-MIN is used as the local dynamic range of a set, and the pixel which constitutes a class tap is re-quantized by L bits based on this dynamic range DR. That is, out of the pixel value of the pixel which constitutes a class tap, the minimum value MIN is subtracted and the division (quantization) of the subtraction value is done by DR/2L. Therefore, when L bit ADRC processing of the class tap is carried out, as compared with the case where a class classification is performed without carrying out ADRC processing of the class tap, the number of classes can be decreased by the pixel value of each pixel which constitutes the class tap being made into L bits, and considering as a value smaller than the number of bits to which L was assigned by the pixel.

[0073] In addition, moreover, when the pixel of the upper bed of a frame, a soffit, a left end, or a right end turns into an attention pixel, since the pixel which adjoins the left or the right the bottom does not exist, it shall constitute a class tap, assuming it to be that

to which the same frame turns up and exists in a frame upside, the bottom, left-hand side, or right-hand side in this case.

[0074] Next, by carrying out the class classification of each pixel which constitutes an attention frame with reference to the flow chart of drawing 11 based on the class tap about the pixel explains the processing (center-of-gravity calculation processing of an attention frame) performed in the center-of-gravity calculation section 21 in the case of searching for the center of gravity of an attention frame.

[0075] In this case, in step S51 thru/or S57, step S11 of drawing 8 thru/or the respectively same processing as the case in S17 are performed. And the pixel p (x y) in a coordinate (x y) is made into an attention pixel, and a class tap is constituted from step S58 corresponding to step S18 of drawing 8 by the attention pixel. And based on the class tap, the class classification of the attention pixel is carried out at either of the K classes, and the class classification result is registered into a class table.

[0076] In the gestalt of operation of drawing 11 namely, the center-of-gravity calculation section 21 In the memory to build in, for example, the frequency fk of the pixel which belongs to the class k about each class k (k= 1, 2, ..., K) as shown in drawing 12 , When the class table which matched integrated value sigmaxk of the x-coordinate of the pixel belonging to Class k and integrated value sigmayk of a y-coordinate is memorized, for example, an attention pixel belongs to Class k While only 1 increments the frequency fk about the class k in a class table, the x-coordinate or y-coordinate of an attention pixel is added to integrated value sigmaxk of an x-coordinate, or integrated value sigmayk of a y-coordinate, respectively.

[0077] In addition, a class table is cleared by 0 whenever processing according to the flow chart of drawing 11 is started like a level table.

[0078] The same processing is repeated by step S56 return and the following after processing of step S58.

[0079] On the other hand, when judged with Variable y not being under Y in step S54, it progresses to step S59 and the center of gravity of the pixel belonging to each class of a class table is searched for. That is, the coordinate (sigmaxk/fk, sigmayk/fk) as which the division of integrated value sigmaxk of the x-coordinate in each class k of a class table or each integrated value sigmayk of a y-coordinate is done in the frequency fk, and it is expressed in step S59 with the division value is searched for as a center of gravity of the pixel belonging to each class k.

[0080] and the step S60 -- progressing -- a class 1 thru/or K -- it is alike, respectively, and the center of gravity of the center of gravity of the pixel which belongs is searched for as a center of gravity of the whole pixel which constitutes an attention frame, and

carries out a return.

[0081] namely, -- step S60 -- a class 1 thru/or K -- it is alike, respectively, and the weighting average which makes weight the frequency f1 thru/or fK is calculated about the center of gravity of the pixel which belongs, and it is outputted as a center of gravity of the whole pixel where the weighting average constitutes an attention frame.

[0082] When searching for the center of gravity of an attention frame by carrying out the class classification of each pixel which constitutes an attention frame here based on the class tap about the pixel, it is desirable to make it ask by the center of gravity of the motion detection range also constituting a class tap about each pixel which constitutes the motion detection range, and performing a class classification based on the class tap.

[0083] In addition, in searching for the center of gravity of the motion detection range by performing a class classification, in the processing which showed the flow chart of drawing 11 , it changes to processing of the step S51, and since it is the same as that of the case where processed steps S31 and S32 shown in the flow chart of drawing 10 , and also it is shown in drawing 11 , it omits the explanation.

[0084] Next, although the center of gravity of an attention frame was searched for with the gestalt of operation of drawing 11 using the center of gravity of the pixel belonging to all the classes that carry out the class classification of each pixel which constitutes an attention frame based on the class tap about the pixel, and are obtained as a result, the center of gravity of an attention frame can be made to ask only using the center of gravity of the pixel which belongs to the specific class obtained as a result of for example, a class classification in addition to this.

[0085] That is, the center of gravity of an attention frame can be asked for the class to which the pixel (suitably henceforth an edge pixel) of the part which is an edge belongs as a specific class only using the center of gravity of the pixel (edge pixel) belonging to the specific class (suitably henceforth an edge class).

[0086] Then, when asking with reference to the flow chart of drawing 13 only using the center of gravity of the edge pixel which belongs to an edge class among the class classification results of each pixel which constitutes an attention frame, the processing (center-of-gravity calculation processing of an attention frame) performed in the center-of-gravity calculation section 21 is explained.

[0087] Also in this case, step S11 of drawing 8 thru/or the respectively same processing as the case in S17 are performed in step S71 thru/or S77. And in step S77, when judged with Variable x being under X, it progresses to step S78, the pixel p (x y) in a coordinate (x y) is made into an attention pixel, and the class classification of the attention pixel is carried out like the case in step S58 of drawing 11 .

[0088] Then, it progresses to step S79 and it is judged [the class obtained as a result of the class classification in step S78] for it being an edge class, i.e., an attention pixel, whether it is an edge pixel.
[0089] Here, an attention pixel is classified into either of the 1024 (= (22) 5) classes when performing a class classification, after carrying out 2-bit ADRC processing of the class tap which consists of 5 pixels which was mentioned above, for example. By the way, when 2-bit ADRC processing of the class tap is carried out, the pixel value of the pixel which constitutes the class tap turns into a value of the 00B, 01B, 10B, or the 11B (B expresses that the value arranged before that is a binary number). Therefore, as mentioned above, when a class tap consists of 4 pixels [an attention pixel and / which adjoins the four directions of the attention pixel, respectively] a total of 5 pixels, it sets. While the time of the pixel value of 4 pixels which adjoins vertically and horizontally, respectively being except 00B while the pixel value of an attention pixel is 00B which is the minimum value, and the pixel value of an attention pixel are 11B which is maximum When the pixel value of 4 pixels which adjoins vertically and horizontally, respectively is except 11B, it is thought that the attention pixel is an edge pixel.
[0090] That is, as shown in drawing 14 (A), when the pixel value of an attention pixel is 00B and the pixel value of 4 pixels which adjoins vertically and horizontally, respectively is 01B, 10B, or the 11B, so to speak, the pixel value is a trough (concave) in the attention pixel. Moreover, as shown in drawing 14 (B), when the pixel value of an attention pixel is 11B and the pixel value of 4 pixels which adjoins vertically and horizontally, respectively is 00B, 01B, or the 10B, so to speak, the pixel value is a crest (convex) in the attention pixel. Therefore, the attention pixel is an edge pixel when shown in drawing 14 .
[0091] In addition, when the pixel value of an attention pixel is 00B and the pixel value of 4 pixels which adjoins vertically and horizontally, respectively is 01B, 10B, or the 11B When the pixel value of a **** and an attention pixel is 11B 81 (= 3x3x3x3) passages and the pixel value of 4 pixels which adjoins vertically and horizontally, respectively is 00B, 01B, or the 10B, there are 81 kinds similarly. Therefore, there is a class (edge class) to which an edge pixel belongs 162 (= 81+81) passages.
[0092] When it is judged with an attention pixel not being an edge pixel by drawing 13 in return and step S79 (i.e., when the classes of an attention pixel are not any of the above-mentioned edge classes which have 162 kinds, either), it returns to step S76.
[0093] Moreover, in step S79, when judged with an attention pixel being an edge pixel (i.e., when the class of an attention pixel is either of the above-mentioned edge classes which have 162 kinds), it progresses to step S80 and the class classification result of an

attention pixel is registered into a class table. That is, at step S80, while the increment of the frequency fk about the class k of an attention pixel of a class table as shown in drawing 12 is carried out only for 1, the x-coordinate or y-coordinate of an attention pixel is added to integrated value sigmaxk of an x-coordinate, or integrated value sigmayk of a y-coordinate, respectively.

[0094] In addition, in performing a class classification and registering only an edge class into a class table only about the attention pixel belonging to an edge class with the gestalt of operation of drawing 13 , for example after carrying out 2-bit ADRC processing of the class tap which consists of 5 pixels as mentioned above since registration to a class table is performed, the number K of classes of a class table is set to 162 which is the number of edge classes mentioned above.

[0095] Since it is classified into either of the 1024 classes as the attention pixel was mentioned above when performing a class classification and registering all classes into a class table on the other hand after carrying out 2-bit ADRC processing of the class tap which consists of 5 pixels, the number K of classes of a class table is set to 1024.

[0096] Therefore, in the gestalt of operation of drawing 13 , magnitude (capacity) of a class table can be made small as compared with the case in the gestalt of operation of drawing 11 .

[0097] The same processing is repeated by step S76 return and the following after processing of step S80.

[0098] On the other hand, when judged with Variable y not being under Y in step S74, it progresses to step S81 and the center of gravity of the pixel belonging to each edge class of a class table is searched for. That is, the coordinate (sigmaxk/fk, sigmayk/fk) as which the division of integrated value sigmaxk of the x-coordinate in each edge class k of a class table or each integrated value sigmayk of a y-coordinate is done in the frequency fk, and it is expressed in step S81 with the division value is searched for as a center of gravity of the pixel belonging to each edge class k.

[0099] and the step S82 -- progressing -- the edge class 1 thru/or K -- it is alike, respectively, and the center of gravity of the center of gravity of the pixel which belongs is searched for as a center of gravity of the whole pixel which constitutes an attention frame, and carries out a return.

[0100] namely, -- step S82 -- the edge class 1 thru/or K -- it is alike, respectively, and the weighting average which makes weight the frequency f1 thru/or fK is calculated about the center of gravity of the pixel which belongs, and it is outputted as a center of gravity of the whole pixel where the weighting average constitutes an attention frame.

[0101] When searching for the center of gravity of an attention frame here only using

what belongs to an edge class among the pixels which constitute an attention frame, it is desirable to also search for the center of gravity of the motion detection range only using what belongs to an edge class among the pixels which constitute the motion detection range.

[0102] In addition, in searching for the center of gravity of the motion detection range only using the pixel belonging to an edge class, in the processing shown in the flow chart of drawing 13 , it changes to processing of the step S71, and since it is the same as that of the case where processed steps S31 and S32 shown in the flow chart of drawing 10 , and also it is shown in drawing 13 , it omits the explanation.

[0103] Next, when an attention frame is what does not have a camera motion to the frame in front of one of them, the camera motion vector of an attention frame should become equal to the camera motion vector of the frame in front of one of them. However, as it mentioned above, when asking for the camera motion vector of a frame, when a motion of a foreground influences, even if there is no camera motion of an attention frame, a different thing from the camera motion vector of the frame in front of one of them may be found as the camera motion vector.

[0104] so, to the camera motion detecting element 12 shown in drawing 5 Form the motion-less judgment section 25 which judges whether an attention frame is what does not have a camera motion to the frame in front of one of them as a dotted line shows to this drawing, and it sets to the vector detecting element 22 further. In being a thing without a camera motion of an attention frame Output as a camera motion vector of an attention frame, and when an attention frame is a thing with a camera motion, the camera motion vector of the frame in front of one of them As it mentioned above, it can ask for the camera motion vector of an attention frame from the center of gravity of an attention frame and the motion detection range.

[0105] By doing in this way, when it is a thing without a camera motion of an attention frame, the camera motion vector of an attention frame can be made equal to the camera motion vector of the frame in front of one of them.

[0106] Then, with reference to the flow chart of drawing 15 , the processing (motion-less judgment processing) which judges whether it is the thing without a camera motion of an attention frame performed in the motion-less judgment section 25 is explained.

[0107] In motion-less judgment processing, step S71 of drawing 13 thru/or the respectively same processing as the case in S79 are performed in step S91 thru/or S99.

[0108] And in step S99, when judged with an attention pixel being an edge pixel, it progresses to step S100 and it is judged whether it is equal to pixel value p' (x y) of the pixel which has the pixel value p of an attention pixel (x y) in the same location in front

of one of them.

[0109] Here, p (x y) in step S100 shall include the case where p (x y) is [| p(x y)-p'(x y) |] less than a predetermined minute value when almost equal to p' (x y) as it is equal to p' (x y).

[0110] In step S100, when judged with it not being equal to pixel value p' (x y) of the pixel which has the pixel value p of an attention pixel (x y) in the same location in front of one of them, step S101 is skipped and it returns to step S96.

[0111] In step S100 moreover, the pixel value p of an attention pixel (x y) When judged with it being equal to pixel value p' (x y) of the pixel in the same location in front of one of them, That is, when equal to pixel value p' (x y) of the pixel before [one] the pixel value p of the attention pixel which is an edge pixel (x y) is in the same location spatially, it progresses to step S101, and the increment only of 1 is carried out and Variable c returns to step S96.

[0112] Here, Variable c is cleared by zero before motion-less judgment processing of drawing 15 is started.

[0113] Then, in step S94, when judged with Variable y not being under Y (i.e., when it processes by making into an attention pixel all the pixels that constitute an attention frame), it progresses to step S102 and it is judged whether Variable c is beyond the predetermined threshold th. When judged with Variable c being beyond the predetermined threshold th in step S102, Namely, the pixel used as a pixel value [being the same as that of the pixel which is in the edge pixel of an attention frame in the same location of one frame ago (almost the same)] When it exists beyond the threshold th, it progresses to step S103, and as a judgment result of whether an attention frame is what does not have a camera motion to the frame in front of one of them, the message of a purport without a motion is outputted to the vector detecting element 22, and ends motion-less judgment processing.

[0114] Moreover, when judged with Variable c not being beyond the predetermined threshold th in step S102, Namely, the pixel used as a pixel value [being the same as that of the pixel which is in the edge pixel of an attention frame in the same location of one frame ago (almost the same)] When it does not exist beyond the threshold th, progress to step S104 and an attention frame receives the frame in front of one of them. As a judgment result of whether it is a thing without a camera motion, the message of a purport with a motion is outputted to the vector detecting element 22, and ends motion-less judgment processing.

[0115] In addition, motion-less judgment processing of drawing 15 is performed in advance of the processing which computes the center of gravity of the attention frame in

the center-of-gravity calculation section 21, and the motion detection range, and is further performed for the frame after the 2nd frame.

[0116] Next, drawing 16 shows the example of a configuration of the background extract section 14 of drawing 2 .

[0117] The camera motion vector v1 of the 1st frame thru/or the Nth frame as a series of images memorized by the camera motion vector storage section 13 (drawing 2) thru/or vN are supplied to the existence range detecting element 31. The existence range detecting element 31 is in the condition which performed alignment of the background of the 1st thru/or the Nth frame, and detects the field (existence range) of the minimum rectangle where the 1st thru/or image of the Nth frame exists in standard coordinates.

[0118] That is, based on the camera motion vector v1 of the 1st frame thru/or the Nth frame thru/or vN, the existence range detecting element 31 is in the condition which performed the alignment about the 1st frame thru/or the Nth frame supposing the condition of having performed alignment of the background, and detects the existence range which is the field of the minimum rectangle where the 1st thru/or the pixel of the Nth frame exist. Furthermore, also in the standard coordinates of the existence range, the coordinate (Xmin, Ymin) of the top-most vertices of most the upper left and the coordinate (Xmax, Ymax) of the top-most vertices of most the lower right are searched for, and the existence range detecting element 31 is supplied to the read-out section 32 and the write-in section 35.

[0119] In addition, the condition of having performed alignment of the background of the 1st frame thru/or the Nth frame can be assumed in standard coordinates by arranging the 1st frame thru/or the Nth frame so that the top-most vertices at the upper left of a frame may be located in the coordinate shown by each camera motion vector v1 thru/or vN, as shown in drawing 17 .

[0120] The read-out section 32 detects and reads the pixel which is in the same location spatially, where alignment of the background of the 1st frame thru/or the Nth frame is performed among the pixels which constitute the 1st frame memorized by the are recording section 11 (drawing 2) thru/or the Nth frame, and it supplies it to the frequency count area 33 and the write-in section 35.

[0121] namely, -- the read-out section 32 -- the coordinate (Xmin, Ymin) from the existence range detecting element 21 -- and (Xmax, Ymax) it being supplied and also The camera motion vector v1 memorized by the camera motion vector storage section 13 (drawing 2) thru/or vN are also supplied. The read-out section 32 First, based on the camera motion vector v1 of the 1st frame thru/or the Nth frame thru/or vN, the condition of having performed alignment of the background about the 1st frame thru/or

the Nth frame is assumed like the existence range detecting element 31. Furthermore, the read-out section 32 carries out the sequential scan of the coordinate (Xmin, Ymin) supplied from the existence range detecting element 21 of standard coordinates, and (Xmax, Ymax) the coordinate of existence within the limits specified, and as shown in drawing 18 , it detects and reads the pixel of the 1st frame thru/or the Nth frame in the condition of having performed alignment of a background in each coordinate (x y).

[0122] In addition, detection of the pixel of the n-th frame located in the coordinate (x y) of standard coordinates in the condition of having performed alignment of the background of the 1st thru/or the Nth frame When the local system of coordinates (suitably henceforth local system of coordinates) which made the zero the pixel at the upper left of [the] the n-th frame are considered so to speak, it can carry out by detecting the pixel which is in the coordinate which subtracted the camera motion vector vn from a coordinate (x y).

[0123] The inside of the pixel to which the frequency count area 33 is supplied from the read-out section 32 and which constitutes the 1st thru/or the Nth frame, The pixel which is in the same location spatially where alignment of the background is performed every [of (calling it hereafter the same location pixel in an alignment condition suitably)] set -- for example, the frequency of the pixel belonging to each level of the pixel value mentioned above -- counting -- carrying out -- the counting -- based on a result, registration to the frequency table memorized by the frequency table storage section 34 of the latter part is performed.

[0124] The frequency table storage section 34 memorizes a frequency table as shown in drawing 19 . That is, the frequency table storage section 34 has memorized the frequency table for matching and registering each level of the pixel value of the same location pixel in an alignment condition, and the rate to the number of pixels of the same location pixel in the alignment condition of the frequency of the pixel belonging to the level about each coordinate (x y) of existence within the limits.

[0125] Here, in the set of the same location pixel in the alignment condition in a certain location (coordinate) of existence within the limits, the level of the large pixel value to the m-th of frequency is called m-th frequency level.

[0126] With the gestalt of operation of drawing 19 , M level and the rate of frequency from the 1st frequency level to the Mth frequency level are registered into a frequency table. therefore -- here -- the frequency count area 33 -- frequency -- the level 1st after M+-- counting of frequency -- a result is not registered into a frequency table but is canceled. however, counting of frequency -- a result can also be made to register with a frequency table about all level

[0127] In addition, as mentioned above, when the range of the value which can be taken as a pixel value is divided into K level, above-mentioned M becomes a value below K.
[0128] The write-in section 35 writes the background pixel which constitutes a whole background based on the frequency table memorized by the frequency table storage section 34 and the pixel supplied from the read-out section 32 in each address equivalent to existence within the limits supplied from the existence range detecting element 31 of the background memory 15 (drawing 2). Furthermore, the write-in section 35 also performs the writing of the background flag to the background flag memory 36.
[0129] The background flag memory 36 memorizes the background flag with which it expresses whether the background pixel is written in about each pixel of existence within the limits. That is, the write-in section 35 writes a background flag in the address of the background flag memory 36 corresponding to the address, when a background pixel is written in the address with the background memory 15. Here, a background flag shall presuppose that it is a 1-bit flag, the background flag corresponding to the address with which the background pixel is written in shall be set to 1, and the background flag corresponding to the address which is not written in yet shall be set to 0.
[0130] Next, with reference to the flow chart of drawing 20 , background extract processing in which a whole background is extracted is explained from the 1st frame performed in the background extract section 14 of drawing 16 thru/or the Nth frame.
[0131] First, in step S111, as the existence range detecting element 31 reads a camera motion vector from the camera motion vector storage section 13 and explained it by drawing 17 , it detects the existence range. And the coordinate (Xmin, Ymin) of the point of the upper left in the standard coordinates of the existence range and the coordinate (Xmax, Ymax) of a lower right point are supplied to the read-out section 32 and the write-in section 35 as information for pinpointing the existence range.
[0132] Ymin-1 as initial value is set to the coordinate (Xmin, Ymin) for pinpointing the existence range, and (Xmax, Ymax) the variable y for scanning the existence range to y shaft orientations of standard coordinates in step S112, if it receives, it progresses to step S113, only 1 increments the variable y, and the read-out section 31 progresses to step S114. At step S114, when judged with it being judged whether Variable y is below Ymax and being below Ymax, it progresses to step S115. At step S115, the read-out section 31 sets Xmin-1 as initial value to the variable x for scanning the existence range in the direction of a x axis of standard coordinates, progresses to step S116, and only 1 increments the variable x and it progresses to step S117. At step S117, when judged

with it being judged whether Variable x is below Xmax and not being below Xmax, the same processing is repeated by step S113 return and the following.

[0133] Moreover, in step S117, when judged with Variable x being below Xmax, it progresses to step S118, and 0 as initial value is set to the variable n for counting the frame number of the 1st frame thru/or the Nth frame as a series of images memorized by the are recording section 11 (drawing 2), and it progresses to step S119. At step S119, it is judged whether Variable n is below N that is the frame number of a series of images with which the increment only of 1 was carried out, it progressed to step S120, and Variable n was memorized by the are recording section 11 (drawing 2).

[0134] In step S120, when judged with Variable n being below N, it progresses to step S121, and where alignment of the background of the 1st frame thru/or the Nth frame is performed, in the read-out section 32, reading appearance of the pixel of the n-th frame in the location of the coordinate (x y) of standard coordinates is carried out from the are recording section 11 (drawing 2). That is, the read-out section 32 is the coordinate (x y) which subtracted the camera motion vector vn from the coordinate (x y) in the local system of coordinates which made the zero the pixel at the upper left of the n-th frame. - The pixel in vn is read from the are recording section 11 (drawing 2).

[0135] In addition, while expressing the x-coordinate or y-coordinate of the camera motion vector vn as xv#n or yv#n, respectively If the side of one frame or the vertical number of pixels is expressing X or Y, respectively, although the read-out section 32 will read the pixel located in the coordinate (x-xv#n, y-yv#n) in the local system of coordinates about the n-th frame In this case, the pixel of the n-th frame does not exist in the coordinate (x-xv#n, y-yv#n) of 0 <=x-xv#n<X and 0 <=y-yv#n<Y which can be set out of range. Therefore, read-out of the pixel of the n-th frame in step S121 is performed, only when x-xv#n is within the limits of 0 <=x-xv#n<X and y-yv#n is within the limits of 0 <=y-yv#n<Y.

[0136] In step S121, if the pixel of the n-th frame is read, the read-out section 32 will supply the pixel to the frequency count area 33 and the write-in section 35, and will return from the are recording section 11 (drawing 2) to step S119. And until it is judged with Variable n not being below N in step S120 Step S119 thru/or processing of S121 are repeated, and by this, where alignment of the background of the 1st frame thru/or the Nth frame is performed The pixel (the same location pixel in an alignment condition) of the 1st frame in the location of the coordinate (x y) of standard coordinates thru/or the Nth frame is supplied to the frequency count area 33 and the write-in section 35. However, as mentioned above, depending on a frame, a pixel may not exist in the coordinate (x y) of standard coordinates, and the pixel of that frame is not contained

in the pixel supplied to the frequency count area 33 and the write-in section 35 in this case.

[0137] If judged with Variable n not being below N in step S120, it will progress to step S122. Then, the frequency count area 33 The pixel value carries out the level classification of each pixel of the 1st thru/or the Nth frame in the condition of having performed alignment of a background in the location of the coordinate (x y) of standard coordinates supplied from the read-out section 32 by whether it belongs to level 1 thru/or which range of the K. Furthermore, the frequency count area 33 carries out counting of the frequency of the pixel belonging to each level, and asks for the rate (rate to the total of the pixel belonging to each level) of the frequency.

[0138] And it progresses to step S123, and the frequency count area 33 is registered into the column (line) of a coordinate (x y) in a frequency table as showed the rate of the frequency of a pixel that the rate of frequency belongs to the level (the 1st frequency level thru/or the Mth frequency level) and each of its level from the 1st place to the Mth place to drawing 19 of the frequency table storage section 34, and returns to step S116.

[0139] When it is judged with Variable y not being below Ymax in step S114 on the other hand, When all the coordinates of existence within the limits are processed, it progresses to step S124. Namely, the write-in section 35 The coordinate which the rate of the pixel belonging to the 1st frequency level has become in the frequency table memorized by the frequency table storage section 34 beyond the predetermined value is detected. Background pixel extract processing which writes in the pixel value corresponding to the 1st frequency level as a pixel value of a background pixel is performed to the address of the background memory 15 corresponding to the coordinate, and it goes to it at step S125. At step S125, about the coordinate of existence within the limits in which a pixel value was not written in background pixel extract processing of step S124, the write-in section 35 performs background escape processing which writes in the pixel value as a background pixel, and ends background extract processing.

[0140] Next, with reference to the flow chart of drawing 21 , the background pixel extract processing which writes in in step S124 of drawing 20 , and the section 35 performs is explained.

[0141] In background pixel extract processing, in step S131 thru/or S136, step S112 of drawing 20 thru/or the respectively same processing as the case in 117 are performed, and it sets to step S136. When judged with Variable x being below Xmax, it is judged by progressing to step S37 and referring to a frequency table whether the rate of the 1st frequency level to a coordinate (x y) is beyond the predetermined threshold Lth.

[0142] When judged with the rate of the 1st frequency level to a coordinate (x y) not

being beyond the predetermined threshold Lth in step S137, That is, when the rate of the frequency of the pixel value with most frequency of the pixel located in a coordinate (x y) among the pixels which constitute the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame is not high, steps S138 and S139 are skipped, and it returns to step S135.

[0143] Therefore, the pixel value of a background pixel is not written in the address of the background memory 15 (drawing 2) corresponding to the coordinate (x y) in the existence range in this case.

[0144] When it is judged with the rate of the 1st frequency level to a coordinate (x y) being beyond the predetermined threshold Lth in step S137 on the other hand, Namely, the inside of the pixel which constitutes the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame, When the rate of the frequency of the pixel value with most frequency of the pixel located in a coordinate (x y) is high, it progresses to step S138 and the write-in section 35 writes a pixel value with the high rate of the frequency in the background memory 15 as a pixel value of the background pixel located in a coordinate (x y).

[0145] That is, the write-in section 35 extracts what belongs to the 1st frequency level among the pixels located in the coordinate (x y) of the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame from the pixel supplied from the read-out section 32, for example, calculates the average. And the write-in section 35 writes the average in the background memory 15 as a pixel value of the background pixel located in a coordinate (x y).

[0146] After processing of step S138, it progresses to step S139, the write-in section 35 sets to 1 the background flag memorized to the address corresponding to the coordinate (x y) of the background flag memory 36 (leave a background flag), and the same processing is repeated until it is judged with Variable y not being below Ymax by step S135 in step S133 return and the following.

[0147] And in step S133, if judged with Variable y not being below Ymax, a return will be carried out.

[0148] Here, the storage value of the background flag memory 36 is cleared by 0 when background pixel extract processing of drawing 21 is started.

[0149] Next, in background pixel extract processing in which it explained by drawing 21 , as mentioned above, when the rate of the frequency of the pixel value with most frequency of the pixel located in a coordinate (x y) among the pixels which constitute the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame is not high, the pixel value as a background is not written in a coordinate (x

y).

[0150] Namely, the inside of the pixel which constitutes the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame from background pixel extract processing, When the rate of the frequency of the pixel value with most frequency of the pixel located in a coordinate (x y) is high, it is written in the background memory 15 as a thing with most pixel values of the frequency probable as a pixel value of the whole background in a coordinate (x y). therefore, when most pixel values of frequency cannot say that it is probable as a pixel value of the whole background in a coordinate (x y), here The inside of the pixel which constitutes the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame, When the rate of the frequency of the pixel value with most frequency of the pixel located in a coordinate (x y) is not high, in background pixel extract processing, the pixel value of a whole background is not written in the address of the background memory 15 corresponding to a coordinate (x y).

[0151] Consequently, by background pixel extract processing, so to speak, the whole background which consists of that a pixel value is written in the background memory 15 is in the vermin condition, and needs to bury the vermin part. For this reason, in background extract processing of drawing 20 , after background pixel extract processing (drawing 21) is performed at step S124, in step S125, background escape processing which extends the background so to speak is performed by fill uping a vermin part with a pixel value.

[0152] Then, with reference to the flow chart of drawing 22 , the background escape processing in step S125 of drawing 20 is explained.

[0153] In background escape processing, in step S141, Ymin-1 as initial value is set to Variable y, and it progresses to step S142, and the increment only of 1 is carried out and the variable y progresses to step S143. At step S143, when judged with it being judged whether Variable y is below Ymax and being below Ymax, it progresses to step S145. At step S145, Xmin-1 as initial value is set to Variable x, and it progresses to step S146, and the increment only of 1 is carried out and the variable x progresses to step S147. At step S147, when judged with it being judged whether Variable x is below Xmax and not being below Xmax, the same processing is repeated by step S142 return and the following.

[0154] Moreover, in step S147, when judged with Variable x being below Xmax, it progresses to step S148 and it is judged whether the background flag memorized to the address of the background flag memory 36 corresponding to a coordinate (x y) is 0. When judged with the background flag memorized to the address of the background flag

memory 36 corresponding to a coordinate (x y) not being 0 in step S148, That is, the background flag is 1, therefore when the pixel value as a whole background is already written in the address of the background memory 15 (drawing 2) corresponding to a coordinate (x y), the same processing is repeated by step S146 return and the following.
[0155] Moreover, when judged with the background flag memorized to the address of the background flag memory 36 corresponding to a coordinate (x y) being 0 in step S148, To namely, the address of the background memory 15 (drawing 2) corresponding to a coordinate (x y) When the pixel value as a whole background is not written in, it still progresses to step S149. Moreover as a surrounding pixel of the pixel located in a coordinate (x y), the bottom, it is judged because whether the background flag about either of the pixels which adjoin the left, the right, the upper left, the lower left, the upper right, and the lower right is 1 refers to the background flag memory 36.
[0156] When judged with neither of the background flags of the pixel which adjoins the pixel located in a coordinate (x y) in step S149 being 1, Namely, a coordinate (x y-1), (x, y+1), (x-1, y), (x+1, y), When the pixel value as a whole background is written in neither of the address of the background memory 15 (drawing 2) corresponding to (x-1, y-1), (x-1, y+1), (x+1, y-1), and each (x+1, y+1) yet, it returns to step S146.
[0157] Moreover, when judged with one background flag of the pixels which adjoin the pixel located in a coordinate (x y) in step S149 being 1, Namely, a coordinate (x y-1), (x, y+1), (x-1, y), (x+1, y), When the pixel value as a whole background is already written in either of the addresses of the background memory 15 (drawing 2) corresponding to (x-1, y-1), (x-1, y+1), (x+1, y-1), and each (x+1, y+1), it progresses to step S150.
[0158] Here, that in which the pixel value as a whole background is written among the pixels (address of the corresponding background memory 15 (drawing 2)) which adjoin the pixel located in a coordinate (x y) is hereafter called written in contiguity pixel suitably.
[0159] At step S150, it is judged whether the level of the pixel value of a written in contiguity pixel and a continuous pixel value is registered into the frequency table as either the 1st to a coordinate (x y) or thru/or the Mth frequency level. Here, a continuous pixel value means pixel values (the same pixel value is included) with a near value.
[0160] In step S150, the level of the pixel value of a written in contiguity pixel and a continuous pixel value as either the 1st to a coordinate (x y) or thru/or the Mth frequency level When judged with registering with the frequency table, constitute the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame. What has the pixel value which follows the pixel value of a written in contiguity pixel in the pixel located in a coordinate (x y) the case where it exists more

than a certain amount of rate -- step S151 -- progressing -- the -- Based on the pixel value which exists more than a certain amount of rate and which follows the pixel value of a written in contiguity pixel, the pixel value as a whole pixel background located in a coordinate (x y) is computed, and it is written in the address with which the background memory 15 (drawing 2) corresponds.

[0161] Namely, supposing the level of the pixel value of a written in contiguity pixel and a continuous pixel value was registered into the frequency table as the m-th frequency level of the 1st to a coordinate (x y) thru/or the Mth frequency level Constitute the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame from a step S151. The average of the pixel value belonging to the m-th frequency level of the pixels located in a coordinate (x y) is computed, and the average is written in the address with which the background memory 15 (drawing 2) corresponds as a pixel value as a whole pixel background located in a coordinate (x y).

[0162] As mentioned above, here in background pixel extract processing The inside of the pixel which constitutes the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame, Although it is written in the background memory 15 as a thing with most pixel values of the frequency probable as a pixel value of the whole background in a coordinate (x y) when the rate of the frequency of the pixel value with most frequency located in a coordinate (x y) is high For example, a certain scenery is made into a background. according to this background pixel extract processing When a series of images which become with the N frame which a certain body moves as a foreground are considered Since the rate of the frequency of the pixel value currently continued and displayed on almost all the frames about the pixel as which most N frames are covered and the background is displayed becomes high, without being hidden by the foreground, the pixel value is written in as a pixel value of a background.

[0163] However, the pixel (suitably henceforth a medium pixel) as which a foreground is displayed when a foreground moves, or a background is displayed Since it becomes the pixel value which constitutes a foreground or becomes the pixel value which constitutes a background, since the pixel value to which the rate of frequency becomes high does not exist, about a medium pixel, the writing of a pixel value is not performed by background pixel extract processing.

[0164] Although what is necessary is just to write in the pixel value of the frame as which the background is displayed there about a medium pixel in order to acquire a whole background, it is difficult to specify the frame as which the background is displayed on the medium pixel. Then, if there are some in which the pixel value as a

whole background is already written and the pixel value and a near pixel value may be displayed as a pixel value of a medium pixel in background escape processing into the pixel which adjoins a medium pixel It is written in the background memory 15 (drawing 2) noting that a pixel value with the thing [having been displayed] is probable as a pixel value when a background is displayed on a medium pixel.

[0165] Therefore, according to background escape processing, it becomes possible to write in the pixel value of the background extremely displayed in one of them only in one certain frame also about the pixel (medium pixel) as which the background was displayed.

[0166] On the other hand in step S150, the level of the pixel value of a written in contiguity pixel and a continuous pixel value as either the 1st to a coordinate (x y) or thru/or the Mth frequency level When judged with not registering with a frequency table, constitute the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame. When what has the pixel value which follows the pixel value of a written in contiguity pixel does not exist in the pixel located in a coordinate (x y), It progresses to step S152, the pixel value as a whole pixel background located in a coordinate (x y) is computed based on the pixel value of a written in contiguity pixel, and it is written in the address with which the background memory 15 (drawing 2) corresponds.

[0167] Namely, although some (written in contiguity pixel) in which the pixel value as a whole background is already written are in the pixel which adjoins a medium pixel When the pixel value and a near pixel value are not displayed as a pixel value of a medium pixel In step S152, the pixel value (for example, the average when two or more written in contiguity pixels exist) of a written in contiguity pixel is written in the background memory 15 (drawing 2) as a pixel value as a whole pixel background located in a coordinate (x y).

[0168] After processing of steps S151 and S152, it progresses to step S153, the background flag of the address corresponding to the coordinate (x y) of the background flag 36 of a pixel with which the pixel value as a whole background was written in at steps S151 or S152, i.e., background flag memory, is set to 1 by each (built), and the same processing is repeated by step S146 return and the following.

[0169] On the other hand, when judged with Variable y not being below Ymax in step S143, it is judged whether all the background flags to each coordinate of existence within the limits which progressed to step S144 and was memorized by the foreground flag memory 36 are 1. In step S143, when judged with some which are not 1 being in the background flag corresponding to each coordinate of existence within the limits (i.e.,

when some in which the pixel value as a whole background is not written yet are in the pixel located in the coordinate of existence within the limits), the same processing is repeated by step S141 return and the following.

[0170] Moreover, in step S144, when judged with there being nothing that is not 1 into the background flag corresponding to each coordinate of existence within the limits (i.e., when the pixel value as a whole background is written in all the pixels located at the coordinate of existence within the limits), a return is carried out.

[0171] The pixel in which according to the processing explained by drawing 22 the pixel value as a whole background was already written as shown in drawing 23 (in this drawing) - When the pixel P (x y) (O mark which attached the slash shows this drawing) which adjoins that the mark shows and in which the pixel value is not written yet exists The written in contiguity pixel which adjoins the pixel P (x y) (in this drawing) The pixel value of Pixels P (x-1, y), P (x-1, y-1), P (x y-1), and P (x+1, y+1), the pixel value, the pixel value which has a continuity, etc. are written in as a pixel value as a whole pixel P (x y) background, and, thereby, the whole background is extended. From this, processing of drawing 22 is called background escape processing.

[0172] Next, drawing 24 shows the example of a configuration of the foreground coding section 16 of drawing 2 .

[0173] The 1st frame as a series of images memorized by the are recording section 11 (drawing 2) thru/or the Nth frame, the whole background memorized by the background memory 15 (drawing 2), and the camera motion vector memorized by the camera motion vector storage section 13 (drawing 2) are supplied to the foreground extract section 41, and the foreground extract section 41 extracts a foreground from the 1st frame thru/or each Nth frame. That is, it is arranging the n-th frame, and the foreground extract section 41 performs alignment of a whole background and the n-th frame, it is subtracting the pixel of the whole background in the same location from each pixel of the n-th frame, and extracts a foreground from the n-th frame so that the point at the upper left of the n-th frame may be located in the location where only the camera motion vector vn shifted in the standard coordinates of a whole background.

[0174] The foreground storage section 42 memorizes the 1st thru/or the foreground of the Nth frame which the foreground extract section 41 extracted.

[0175] The camera motion vector memorized by the camera motion vector storage section 13 (drawing 2) is supplied to the foreground are recording image configuration section 43, and the foreground are recording image configuration section 43 constitutes a front are recording image and a back are recording image using the foreground of the 1st frame thru/or the Nth frame memorized by the foreground storage section 42 based

on the camera motion vector. Namely, the foreground are recording image configuration section 43 is based on a camera motion vector, as shown in drawing 25 . The foreground of the 1st frame thru/or the Nth frame in the condition of having performed alignment of a background is assumed. The back are recording image obtained when the foreground of the 1st frame thru/or the Nth frame is seen toward the travelling direction of time amount (image constituted by the foreground at which it looked from the past), The front are recording image (image constituted by the foreground at which it looked from the future) obtained when it goes to the travelling direction and hard flow of time amount is constituted.

[0176] In addition, a front are recording image is the sequence of the 1st frame to the Nth frame, and can acquire the pixel value of the foreground of the 1st frame thru/or the Nth frame in the condition of having performed alignment of a background, by overwriting memory etc. Similarly, a back are recording image is the sequence of the Nth frame to the 1st frame, and can acquire the pixel value of the foreground of the 1st frame thru/or the Nth frame in the condition of having performed alignment of a background, by overwriting memory etc.

[0177] The foreground are recording image storage section 44 memorizes the front are recording image and back are recording image which were constituted in the foreground are recording image configuration section 43.

[0178] The study section 45 performs study processing which asks for the prediction coefficient for predicting the pixel which constitutes the foreground of the 1st frame thru/or each Nth frame from the pixel which constitutes the front are recording image memorized by the foreground are recording image storage section 44 and a back are recording image, and the error image which was further memorized by the error image storage section 49 if needed, and which is mentioned later.

[0179] The prediction coefficient storage section 46 memorizes the prediction coefficient called for by performing study in the study section 45.

[0180] The adaptation processing section 47 performs adaptation processing which predicts the foreground of the 1st frame thru/or each Nth frame using the pixel which constitutes the front are recording image and back are recording image which were memorized by the foreground are recording image storage section 44, the prediction coefficient memorized by the prediction coefficient storage section 46, and the error image further memorized by the error image storage section 49 if needed.

[0181] Here, the study processing performed in the study section 45 and the adaptation processing performed in the adaptation processing section 47 are explained.

[0182] The forecast of the pixel which constitutes the image (here a front are recording

image and a back are recording image, and an error image) which exists now from adaptation processing, for example, and the pixel which constitutes a desired image (here foreground of the 1st frame thru/or each Nth frame) by linear combination with a predetermined prediction coefficient is calculated.

[0183] On the other hand, by study processing, while using a desired image (suitably henceforth a request image) as educator data The image (suitably henceforth an existence image) which exists when it is going to ask for the request image is used as student data. Forecast [of the pixel value y of the pixel (suitably henceforth a request pixel) which constitutes a request image] E [y] For example, the pixel value x1 of a some existence pixel (pixel which constitutes an existence image), x2, and the set of ..., The prediction coefficient for asking with the primary linearity joint model specified by the predetermined prediction coefficients w1 and w2 and the linear combination of ... is called for. In this case, forecast E [y] can be expressed with a degree type.

[0184]

E[y] =w1x1+w2 x2+ ... ... (1)

[0185] It is [Equation 1] about matrix Y' which becomes by the matrix X which becomes by the matrix W which becomes by the set of a prediction coefficient wj, and the student data aggregate in order to generalize a formula (1), and the set of forecast E [y].

$$X=\begin{pmatrix} x_{11} & x_{12} & \cdots & x_{1J} \\ x_{21} & x_{22} & \cdots & x_{2J} \\ \cdots & \cdots & \cdots & x_{1J} \\ x_{I1} & x_{I2} & \cdots & x_{IJ} \end{pmatrix}$$

$$W=\begin{pmatrix} w_1 \\ w_2 \\ \cdots \\ w_J \end{pmatrix},\ Y'=\begin{pmatrix} E[y_1] \\ E[y_2] \\ \cdots \\ E[y_I] \end{pmatrix}$$

If a definition is come out and given, the following observation equations will be materialized.

[0186]

XW=Y' ... (2)

Here, the component xij of Matrix X means the j-th student data in the student data aggregate (student data aggregate used for prediction of the educator data yi of the i-th affair) of the i-th affair, and the component wj of Matrix W expresses the prediction coefficient which a product with the j-th student data in the student data aggregate calculates. Moreover, yi expresses the educator data of the i-th affair, therefore E [yi] expresses the forecast of the educator data of the i-th affair. In addition, y in the left part of a formula (1) omits the suffix i of the component yi of Matrix Y, and x1 in the

right-hand side of a formula (1), x2, and ... also omit the suffix i of the component xij of Matrix X.

[0187] And it considers applying a least square method to this observation equation, and asking for forecast E [y] near the pixel value y of a request pixel. In this case, it is [Equation 2] about the matrix E which becomes by the set of the matrix Y which becomes by the set of the true pixel value y of the request pixel used as educator data, and the remainder e of forecast E [y] to the pixel value y of a request pixel.

$$E=\begin{bmatrix} e_1 \\ e_2 \\ \cdots \\ e_I \end{bmatrix},\ Y=\begin{bmatrix} y_1 \\ y_2 \\ \cdots \\ y_I \end{bmatrix}$$

If a definition is come out and given, the following remainder equations will be materialized from an equation (2).

[0188]

XW=Y+E ... (3)

[0189] In this case, the prediction coefficient wj for asking for forecast E [y] near the pixel value y of a request pixel is a square error [several 3].

$$\sum_{i=1}^{I} e_i^2$$

It can ask by making it min.

[0190] Therefore, it will be called an optimum value, when what differentiated the above-mentioned square error with the prediction coefficient wj is set to 0, namely, in order that the prediction coefficient wj which fills a degree type may ask for forecast E [y] near the pixel value y of a request pixel.

[0191]

[Equation 4]

$$e_1 \frac{\partial e_1}{\partial w_j} + e_2 \frac{\partial e_2}{\partial w_j} + \cdots + e_I \frac{\partial e_I}{\partial w_j} = 0 \quad (j=1, 2, \cdots, J)$$

... (4)

[0192] Then, a degree type is first materialized by differentiating a formula (3) with a prediction coefficient wj.

[0193]

[Equation 5]

$$\frac{\partial e_i}{\partial w_1}=x_{i1},\ \frac{\partial e_i}{\partial w_2}=x_{i2},\ \cdots,\ \frac{\partial e_i}{\partial w_J}=x_{iJ},\quad (i=1,2,\cdots,I)$$

... (5)

[0194] A formula (6) is obtained from a formula (4) and (5).

[0195]

[Equation 6]

$$\sum_{i=1}^{I} e_i x_{i1}=0, \sum_{i=1}^{I} e_i x_{i2}=0, \sum_{i=1}^{I}\cdots e_i x_{iJ}=0$$

... (6)

[0196] Furthermore, if the relation of the student data xij in the remainder equation of an equation (3), a prediction coefficient wj, the educator data yi, and Remainder ei is taken into consideration, the following normal equations can be obtained from an equation (6).

[0197]

[Equation 7]

$$\begin{cases} (\sum_{i=1}^{I} x_{i1}x_{i1})w_1+(\sum_{i=1}^{I} x_{i1}x_{i2})w_2+\cdots+(\sum_{i=1}^{I} x_{i1}x_{iJ})w_J=(\sum_{i=1}^{I} x_{i1}y_i) \\ (\sum_{i=1}^{I} x_{i2}x_{i1})w_1+(\sum_{i=1}^{I} x_{i2}x_{i2})w_2+\cdots+(\sum_{i=1}^{I} x_{i2}x_{iJ})w_J=(\sum_{i=1}^{I} x_{i2}y_i) \\ \cdots \\ (\sum_{i=1}^{I} x_{iJ}x_{i1})w_1+(\sum_{i=1}^{I} x_{iJ}x_{i2})w_2+\cdots+(\sum_{i=1}^{I} x_{iJ}x_{iJ})w_J=(\sum_{i=1}^{I} x_{iJ}y_i) \end{cases}$$

... (7)

[0198] Each equation which constitutes the normal equation of an equation (7) is that only a certain amount of number prepares the set of the student data xij and the educator data yi. Only the same number as several J of the prediction coefficient wj for which it should ask can be built, therefore a formula (7) can be asked for the optimal prediction coefficient wj by solution Lycium chinense (however, in order to solve a formula (7), in a formula (7), the matrix which consists of multipliers concerning a prediction coefficient wj needs to be regular). In addition, in solving a formula (7), it is possible to sweep out and to, use law (method of elimination of Gauss-Jordan) etc. for example.

[0199] Study processing asks for the optimal prediction coefficient wj as mentioned

above, and adaptation processing asks for forecast E [y] near the pixel value y of a request pixel by the formula (1) using the prediction coefficient wj.

[0200] That is, in the study section 45 or the adaptation processing section 47, while using as an existence image the front are recording image memorized by the foreground are recording image storage section 44 and a back are recording image, and the error image further memorized by the error image storage section 49 if needed, study processing or adaptation processing is performed, respectively considering the foreground of the 1st frame thru/or each Nth frame as a request image.

[0201] In addition, although adaptation processing is not included in an existence image, it is the point that the component contained in a request image is reproduced, for example, differs from mere interpolation processing. That is, in adaptation processing, as long as a formula (1) is seen, it is the same as that of the interpolation processing using the so-called interpolation filter, but since [for which the prediction coefficient w equivalent to the tap multiplier of the interpolation filter uses the educator data y] it asks by study so to speak, the component contained in a request image is reproducible. From this, adaptation processing can be called processing which, so to speak, has a creation (resolution imagination) operation of an image.

[0202] The error count section 48 reads the foreground of the 1st frame thru/or each Nth frame from the foreground storage section 42, and calculates the prediction error of the forecast of the foreground of the 1st frame thru/or each Nth frame called for in the adaptation processing section 47. Namely, the error count section 48 calculates a prediction error for every pixel by subtracting the true value of the pixel value of the pixel from the forecast of the pixel which constitutes the foreground of the n-th frame.

[0203] The error image storage section 49 memorizes the image (suitably henceforth an error image) which becomes by the prediction error of the foreground of the 1st frame thru/or the Nth frame called for in the error count section 48.

[0204] The error judging section 50 calculates for example, the absolute value sum of the prediction error as a pixel value of each pixel which constitutes the error image memorized by the error image storage section 49, and judges whether the absolute value sum has become below a predetermined threshold (following).

[0205] MUX (multiplexer)51 is based on the judgment result by the error judging section 50. To the prediction coefficient and pan which were memorized by the front are recording image memorized by the foreground are recording image storage section 44 and a back are recording image, and the prediction coefficient storage section 46 The error image memorized by the error image storage section 49 is multiplexed if needed, and the multiplexing data obtained as a result are outputted to a multiplexer 17

(drawing 2) as a coding result of the foreground of the 1st frame thru/or each Nth frame.

[0206] Next, drawing 26 shows the example of a configuration of the study section 45 of drawing 24 .

[0207] The front are recording image memorized by the foreground are recording image storage section 44 and a back are recording image (suitably henceforth [both are included and] a foreground are recording image), and the error image further memorized by the error image storage section 49 if needed are supplied to the prediction tap configuration section 61. And the prediction tap configuration section 61 sets as an attention pixel what is going to calculate a forecast among the pixels which constitute the foreground of the 1st frame thru/or each Nth frame in the condition of having performed alignment of a background to standard coordinates. The pixel of the front are recording image in the location near an attention pixel and a space target and a back are recording image and the pixel of an error image are extracted, and it outputs to the normal equation configuration section 62 as a prediction tap used for calculating the forecast of an attention pixel by adaptation processing.

[0208] A prediction tap is supplied from the prediction tap configuration section 61, and also the pixel which constitutes the foreground of the 1st frame memorized by the foreground storage section 42 thru/or each Nth frame is supplied to the normal equation configuration section 62. And the normal-equation configuration section 62 performs the add lump for the pixel (educator data) and prediction tap (student data) of the foreground used as an attention pixel.

[0209] That is, the normal equation configuration section 62 performs the multiplication (xijxi'j') of the student data (prediction tap) used as the multiplier of a prediction coefficient in the left part of the normal equation of an equation (7), and the operation equivalent to a summation (sigma) using a prediction tap.

[0210] Furthermore, the normal equation configuration section 62 performs the multiplication (xijyj) of the student data (prediction tap) in the right-hand side of the normal equation of an equation (7), and educator data (attention pixel), and the operation equivalent to a summation (sigma) using a prediction tap and an attention pixel.

[0211] The normal equation having held as an attention pixel and having shown by this the pixel from which the above processing constitutes the foreground of the 1st frame thru/or each Nth frame at a ceremony (7) is built in the normal equation configuration section 62.

[0212] And the prediction coefficient calculation section 63 asks for a prediction

coefficient, and makes the prediction coefficient storage section 46 (drawing 24) supply and memorize after that the normal equation generated in the normal equation configuration section 62 by solution Lycium chinense.

[0213] Here, with the gestalt of this operation, forecast [of the pixel value An (x y) of the pixel which is in the location (x y) of n-th-frame standard coordinates' existence within the limits among the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame] E [An (x y)] is called for in the adaptation processing section 47 of drawing 24 for example, according to a degree type.

[0214]

E[An(x,y)]=g(F,B,E,n)

... (8)

Here, in a formula (8), F, B, and E express a front are recording image, a back are recording image, and an error image, respectively, and Function g (F, B, E, n) is defined by the degree type equivalent to the linearity linear expression of a formula (1).

[0215]

g(F, B, E, n) =wF1xf1+wF2xf2+ ... + wB1xb1+wB2xb2+ ... + wE1xe1+wE2xe2+ ... +wxn ... (9)

Here, in a formula (9), wF1, wF2, ..., wB1 and wB2, ..., wE1, wE2, ..., w express a prediction coefficient. Moreover, the pixel which constitutes the prediction tap about an attention pixel among the pixels from which e1, e2, and ... constitute the error image E for the pixel which constitutes the prediction tap about an attention pixel among the pixels from which b1, b2, and ... constitute the back are-recording image B for the pixel which constitutes the prediction tap about an attention pixel among the pixels from which f1, f2, and ... constitute the front are recording image F is expressed, respectively.

[0216] When Function g (F, B, E, n) is defined by the equation (9), in the normal equation configuration section 62 of drawing 26 The normal equation for asking for the prediction coefficients wF1 and wF2 in an equation (9), ..., wB1 and wB2, ..., wE1, wE2, ..., w is built. In the prediction coefficient calculation section 63 Prediction coefficients wF1 and wF2, ..., wB1 and wB2, ..., wE1, wE2, ..., w are asked for the normal equation by solution Lycium chinense. Therefore, the prediction coefficients wF1 and wF2 of one set, ..., wB1 and wB2, ..., wE1, wE2, ..., w are called for about the foreground of the 1st frame thru/or all the Nth frame in this case.

[0217] Next, drawing 27 shows the example of a configuration of the adaptation processing section 47 of drawing 24 .

[0218] The foreground are recording image memorized by the foreground are recording image storage section 44 and the error image further memorized by the error image

storage section 49 if needed are supplied to the prediction tap configuration section 71. and the prediction tap configuration section 71 like the case in the prediction tap configuration section 61 of drawing 26 What is going to calculate a forecast among the pixels which constitute the foreground of the 1st frame thru/or each Nth frame in the condition of having performed alignment of a background is set to standard coordinates as an attention pixel. The pixel of the front are recording image in the location near an attention pixel and a space target and a back are recording image and the pixel of an error image are extracted, and it outputs to the prediction operation part 72 as a prediction tap.

[0219] A prediction tap is supplied from the prediction tap configuration section 71, and also the prediction coefficient memorized by the prediction coefficient storage section 46 (drawing 24) is supplied to the prediction operation part 72. And in the prediction operation part 72, the forecast of the pixel of a foreground used as an attention pixel is calculated by calculating the linearity linear expression defined by a formula (8) and (9) using a prediction tap and a prediction coefficient, and is outputted to the error count section 48.

[0220] Next, with reference to the flow chart of drawing 28 , the foreground coding processing which encodes the foreground of the 1st frame thru/or each Nth frame performed in the foreground coding section 16 of drawing 24 is explained.

[0221] It sets to step S161 first. The foreground extract section 41 The camera motion vector memorized by the camera motion vector storage section 13 (drawing 2), And as it mentioned above, a foreground is extracted, and the foreground storage section 42 is supplied and is made to memorize using the whole background memorized by the background memory 15 (drawing 2) from each image of the 1st frame thru/or the Nth frame memorized by the are recording section 11 (drawing 2).

[0222] And it progresses to step S162, and the foreground are recording image configuration section 43 constitutes a front are recording image and a back are recording image which were explained by drawing 25 from a foreground of the 1st frame memorized by the foreground storage section 42 thru/or each Nth frame, and the foreground are recording image storage section 44 is made to supply and memorize it, and it progresses to step 163.

[0223] At step S163, study is performed using the pixel which constitutes the front are recording image memorized by the foreground are recording image storage section 44 in the study section 45 and a back are recording image, and the error image further memorized by the error image storage section 49 if needed, and, thereby, the prediction coefficient for predicting the pixel which constitutes the foreground of the 1st frame

thru/or each Nth frame is called for.

[0224] Here, when study processing is first performed at step S163, since the error image is not memorized by the error image storage section 49, study is still performed in it, without using an error image (it being unable to use).

[0225] The prediction coefficient obtained as a result of the study in step S163 is supplied to the prediction coefficient storage section 46 from the study section 45, and is memorized in the form to overwrite. If a prediction coefficient is memorized by the prediction coefficient storage section 46, it will set to step S164. The adaptation processing section 47 To the pixel which constitutes the front are recording image and back are recording image which were memorized by the foreground are recording image storage section 44, the prediction coefficient memorized by the prediction coefficient storage section 46, and a pan Adaptation processing which calculates the forecast of each pixel which constitutes the foreground of the 1st frame thru/or each Nth frame is performed by calculating a formula (8) and the linearity linear expression of (9) using the error image memorized by the error image storage section 49 if needed.

[0226] Here, when adaptation processing is first performed at step S164, since the error image is not memorized by the error image storage section 49, adaptation processing is still performed in it, without using an error image (it being unable to use).

[0227] The forecast of each pixel which constitutes the foreground of the 1st frame obtained as a result of the adaptation processing in step S164 thru/or each Nth frame is supplied to the error count section 48, in the error count section 48, in step S165, it is referring to the foreground of the 1st frame memorized by the foreground storage section 42 thru/or each Nth frame, and the prediction error of the forecast of each pixel which constitutes the foreground is searched for.

[0228] And it progresses to step S166, and about each location of standard coordinates' existence within the limits, the absolute value of the prediction error in the location extracts the pixel which is max from the pixel which constitutes the foreground of the 1st frame thru/or each Nth frame, and supplies the error count section 48 to the error image storage section 49 by using the image which becomes by the prediction error of the extracted pixel as an error image. In the error image storage section 49, the error image from the error count section 48 is memorized.

[0229] Then, it progresses to step S167, total of the absolute value of the pixel value (prediction error) of each pixel which constitutes the error image memorized by the error image storage section 49 in the error judging section 50 is called for, and it is judged whether the total is below a predetermined threshold (following).

[0230] In step S167, when it judges that total of the absolute value of the pixel value

(prediction error) of each pixel which constitutes an error image is not below a predetermined threshold (i.e., when the precision of the forecast of the foreground obtained from a prediction coefficient, and a front are recording image and a back are recording image (the need is accepted and it is an error image further) is not high), the same processing is repeated by step S163 return and the following.
[0231] In addition, at next steps S163 or S164, since the error image is memorized by the error image storage section 49 in this case, as shown in drawing 29 , an error image besides a front are recording image and a back are recording image is also used, a prediction tap is constituted, and study processing or adaptation processing is performed, respectively.
[0232] A prediction coefficient when it judges that total of the absolute value of the pixel value (prediction error) of each pixel which constitutes an error image is below a predetermined threshold in step S167 on the other hand, A front are recording image and a back are recording image (further) When the precision of the forecast of the foreground obtained from an error image if needed is high, it progresses to step S168. The error judging section 50 MUX51 is controlled, and the front are recording image memorized by the foreground are recording image storage section 44 and a back are recording image, the prediction coefficient memorized by the prediction coefficient storage section 46, and when the error image is memorized by the error image storage section 49, the error image is made to read and multiplex further. And MUX51 outputs the multiplexing data obtained as a result of the multiplexing to a multiplexer 17 (drawing 2) as a coding result of the foreground of the 1st frame thru/or each Nth frame, and ends foreground coding processing.
[0233] In addition, it may be made to make the new error image obtained whenever processing of step S166 is performed memorize in the form which overwrites the already memorized error image, and it leaves the already memorized error image to the error image storage section 49 as it is, and you may make it make it memorize it.
[0234] When making a new error image memorize in the form which overwrites the error image already memorized by the error image storage section 49, although a certain amount of limitation is always in improvement in the precision of the forecast of a foreground since the number of error images is one even if study of a prediction coefficient is performed repeatedly, they can lessen the amount of data of multiplexing data.
[0235] Although the amount of data of multiplexing data increases somewhat on the other hand since an error image becomes two or more sheets in leaving the error image already memorized by the error image storage section 49 in a new error image as it is

and making it memorize Since the error image of two or more sheets is used for a front are recording image and a back are recording image, and a list, a prediction tap is constituted and study processing or adaptation processing is performed, respectively as shown in drawing 30 , the precision of the forecast of a foreground can be raised more. In addition, drawing 30 shows the case where there are two error images.

[0236] Moreover, although it asked for the prediction coefficient which calculates a forecast, also uses an error image when the prediction error is large, performs study processing again, and makes a prediction error small by performing adaptation processing using the prediction coefficient for which it asked by study processing in the above-mentioned case Irrespective of the size of a prediction error, it is also possible to make it output the prediction coefficient obtained as a result of study processing of the beginning by the study section 45 as a coding result of a foreground with the front are recording image and back are recording image which were memorized by the foreground are recording image storage section 44. In this case, the foreground coding section 16 is that the adaptation processing section 47, the error count section 48, the error image storage section 49, and the error judging section 50 can be constituted without preparing.

[0237] Furthermore, in an above-mentioned case, a formula (9) defines the function g (F, B, E, n) which calculates the forecast of a foreground, and although it asked for the prediction coefficient of one set used common to this calculating the forecast of the foreground of the 1st frame thru/or all the Nth frame, in addition to this, a prediction coefficient can also be asked [every frame and] for every multiple frame.

[0238] Namely, what is necessary is to define Function g (F, B, E, n), as shown in an equation (10), to build a normal equation for every frame, and just to make it ask for a prediction coefficient by solution Lycium chinense, in asking for a prediction coefficient for every frame.

[0239]

g(F, B, E, n) =wF1nxf1+wF2nxf2+ ... + wB1nxb1+wB2nxb2+ ...
+wE1nxe1+wE2nxe2+ ... ... (10)

Here, in a formula (10), the prediction coefficient used for wF1n, wF2n, ..., wB1n, wB2n, ..., wE1n, wE2n, and ... calculating the forecast of the foreground of the n-th frame is expressed.

[0240] Moreover, although the forecast of a foreground was calculated by linearity primary prediction, the forecast of a foreground can also be made to ask more than by the secondary high order prediction type in addition to this here.

[0241] Furthermore, although it was made to learn the prediction coefficient for

calculating the forecast of the foreground of the 1st frame thru/or each Nth frame here using the front are recording image and back are recording image which consisted of foregrounds of the 1st frame thru/or each Nth frame, it is also possible for it to be made to perform study of a prediction coefficient using images other than a front are recording image and a back are recording image. That is, study of a prediction coefficient can be made to be carried out by operating the pixel value of the image which becomes with the noise so that the prediction error of the forecast of a foreground may be made small using the image of one or more sheets which becomes with a noise.

[0242] Next, drawing 31 shows the example of a configuration of the decoder 2 of drawing 1 .

[0243] The coded data transmitted through a transmission medium 3 (drawing 1) or the coded data reproduced from the record medium 4 (drawing 1) is supplied to DMUX(demultiplexer) 81, and DMUX81 divides into a front are recording image, a back are recording image, a prediction coefficient, a whole background, and a camera motion vector the coded data supplied there. In addition, when an error image is contained in coded data, DMUX81 also separates the error image from coded data.

[0244] Further, a front are recording image and a back are recording image, and when an error image is contained in coded data, the error image is supplied to the image storage section 86 from DMUX81. Moreover, a prediction coefficient, a whole background, or a camera motion vector is supplied to the prediction coefficient storage section 82, the background memory 87, and the camera motion vector storage section 88 from DMUX81, respectively.

[0245] The prediction coefficient storage section 82 memorizes the prediction coefficient from DMUX81. The adaptation processing section 83 calculates the forecast of the foreground of the 1st frame thru/or each Nth frame by the front are recording image memorized by the prediction coefficient memorized by the prediction coefficient storage section 82 and the list at the image storage section 86 and the back are recording image, and performing the same adaptation processing as a case [in / using an error image / corresponding to the need further / the adaptation processing section 47 of drawing 24].

[0246] The foreground storage section 84 memorizes the forecast of the foreground of the 1st frame thru/or each Nth frame called for by the adaptation processing section 83 as a decode result of the foreground of the 1st frame thru/or each Nth frame.

[0247] The synthetic section 85 is based on the camera motion vector vn of the n-th frame memorized by the camera motion vector storage section 88 from the whole background memorized by the background memory 87. The background of the n-th frame is started (extracting), and by compounding the decode result of the background

of the n-th frame, and the foreground of the n-th frame memorized by the foreground storage section 84, the image of the n-th frame is decoded and it outputs.
[0248] The image storage section 86 memorizes an error image in the front are recording image supplied from DMUX81 and a back are recording image, and a list. The background memory 87 memorizes the whole background supplied from DMUX81. The camera motion vector storage section 88 memorizes the camera motion vector of the 1st frame supplied from DMUX81 thru/or each Nth frame.
[0249] Next, with reference to the flow chart of drawing 32 , the decode processing which decodes the image of the 1st frame thru/or the Nth frame as a series of images performed in the decoder 2 of drawing 31 is explained.
[0250] First, in step S171, DMUX81 divides into a front are recording image, a back are recording image, a required error image, a prediction coefficient, a whole background, and a camera motion vector the coded data supplied there. A front are recording image, a back are recording image, and a required error image are supplied to the image storage section 86, and are memorized. Moreover, a prediction coefficient, a whole background, or a camera motion vector is supplied to the prediction coefficient storage section 82, the background memory 87, and the camera motion vector storage section 88, respectively, and is memorized.
[0251] Then, it progresses to step S172, and using the prediction coefficient memorized by the prediction coefficient storage section 82, the front are recording image memorized by the list at the image storage section 86, a back are recording image, and a required error image, the adaptation processing section 83 is performing the same adaptation processing as the case in the adaptation processing section 47 of drawing 24 , and calculates the forecast of the foreground of the 1st frame thru/or each Nth frame. This forecast is supplied to the foreground storage section 84, and is memorized as a decode result of the foreground of the 1st frame thru/or each Nth frame.
[0252] And it progresses to step S173, and in the synthetic section 85, based on the camera motion vector vn of the n-th frame memorized by the camera motion vector storage section 88, the background of the n-th frame is started from the whole background memorized by the background memory 87, and the decode result of the background of the n-th frame and the foreground of the n-th frame memorized by the foreground storage section 84 is compounded. In the synthetic section 85, the above processing is performed about the 1st frame thru/or all the Nth frame, and ends decode processing.
[0253] Next, hardware can also perform a series of processings mentioned above, and software can also perform. When software performs a series of processings, the program

which constitutes the software is installed in the computer built into the encoder 1 and decoder 2 as hardware of dedication, or the general-purpose computer which performs various kinds of processings by installing various kinds of programs.

[0254] Then, the medium used in order to install in a computer the program which performs a series of processings mentioned above and to make it into the condition which can be performed by computer with reference to drawing 33 is explained.

[0255] As shown in drawing 33 (A), a user can be provided with a program in the condition of having installed in the hard disk 102 and semiconductor memory 103 as a record medium which are built in the computer 101 beforehand.

[0256] Or as shown in drawing 33 (B), a program can be stored in record media, such as a floppy disk 111, CD-ROM (Compact Disc Read Only Memory)112, the MO (Magneto optical) disk 113, DVD (Digital Versatile Disc)114, a magnetic disk 115, and semiconductor memory 116, temporarily or permanently, and can be offered as a software package again.

[0257] Furthermore, it transmits to a computer 101 on radio, or a program is transmitted to a computer 123 with a cable through the networks 131, such as LAN (Local Area Network) and the Internet, and can be made to store in the hard disk 102 to build in in a computer 101 through the satellite 122 for digital satellite broadcasting services from the download site 121, as shown in drawing 33 (C).

[0258] The medium in this description means the concept of the wide sense containing all these media.

[0259] Moreover, it is not necessary to necessarily process the step which describes the program offered by the medium to time series in accordance with the sequence indicated as a flow chart, and it is a juxtaposition thing also including the processing (for example, parallel processing or processing by the object) performed according to an individual in this description.

[0260] Next, drawing 34 shows the example of a configuration of the computer 101 of drawing 33 .

[0261] The computer 101 contains CPU (Central Processing Unit)142, as shown in drawing 34 . The input/output interface 145 is connected to CPU142 through the bus 141, and CPU142 will perform the program stored in ROM (Read Only Memory)143 corresponding to the semiconductor memory 103 of drawing 33 (A) according to it, if a command is inputted when the input section 147 which consists of a keyboard, a mouse, etc. is operated by the user through an input/output interface 145. Or it is transmitted from the program and satellite 122 with which CPU142 is stored in the hard disk 102 again, or a network 131, and the program which reading appearance was carried out

from the program which was received in the communications department 148 and installed on the hard disk 102 or the floppy disk 111 with which the drive 149 was equipped, CD-ROM112, MO disk 113, DVD114, or the magnetic disk 115, and was installed on the hard disk 102 is loaded to RAM (Random Access Memory)144, and is performed. And CPU142 outputs the processing result to the display 146 which consists of LCD (Liquid CryStal Display) etc. through an input/output interface 145 if needed.
[0262]
[Effect of the Invention] According to the medium, the pixel which is in the same location spatially where alignment of the background of each of that screen is performed is detected by the image processing system of this invention and the image-processing approach, and the list from a series of images, and counting of the frequency of the pixel value of the pixel which is in the same location spatially is carried out to them. And based on the background pixel the rate of frequency to the number of the pixel which is in the same location spatially was remembered to be by background-image storage means to memorize a background image, as a pixel value of the background pixel from which the pixel value beyond a predetermined value constitutes a background image, and the pixel value was remembered to be, the background image memorized by the background-image storage means is extended. Therefore, it becomes possible from a series of images to extract a background with a sufficient precision.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is drawing showing the example of a configuration of the gestalt of 1 operation of the picture transmission equipment which applied this invention.
[Drawing 2] It is the block diagram showing the example of a configuration of the encoder 1 of drawing 1 .
[Drawing 3] It is drawing showing a series of images memorized by the are recording section 11 of drawing 2 .
[Drawing 4] It is drawing for explaining processing of the camera motion detecting element 12 of drawing 2 .
[Drawing 5] It is the block diagram showing the example of a configuration of the camera motion detecting element 12 of drawing 2 .
[Drawing 6] It is drawing for explaining how asking for the camera motion vector by the camera motion detecting element 12 of drawing 5 .

[Drawing 7] It is a flow chart for explaining processing (camera motion detection processing) of the camera motion detecting element 12 of drawing 5 .
[Drawing 8] It is a flow chart for explaining the 1st example of the detail of the processing (center-of-gravity calculation processing of an attention frame) in step S3 of drawing 7 .
[Drawing 9] It is drawing showing a level table.
[Drawing 10] It is a flow chart for explaining the detail of the processing (center-of-gravity calculation processing of the motion detection range) in step S4 of drawing 7 .
[Drawing 11] It is a flow chart for explaining the 2nd example of the detail of the processing in step S3 of drawing 7 .
[Drawing 12] It is drawing showing a class table.
[Drawing 13] It is a flow chart for explaining the 3rd example of the detail of the processing in step S3 of drawing 7 .
[Drawing 14] It is drawing for explaining an edge pixel.
[Drawing 15] It is a flow chart for explaining the detail of processing (motion-less judgment processing) of the motion-less judgment section 25 of drawing 5 .
[Drawing 16] It is the block diagram showing the example of a configuration of the background extract section 14 of drawing 2 .
[Drawing 17] It is drawing for explaining processing of the drawing 16's existence range detecting element 31.
[Drawing 18] It is drawing for explaining processing of the read-out section 32 of drawing 16 .
[Drawing 19] It is drawing showing a frequency table.
[Drawing 20] It is a flow chart for explaining processing (background extract processing) of the background extract section 14 of drawing 16 .
[Drawing 21] It is a flow chart for explaining the detail of processing (background pixel extract processing) of step S124 of drawing 20 .
[Drawing 22] It is a flow chart for explaining the detail of processing (background escape processing) of step S125 of drawing 20 .
[Drawing 23] It is drawing for explaining background escape processing of drawing 22 .
[Drawing 24] It is the block diagram showing the example of a configuration of the foreground coding section 16 of drawing 2 .
[Drawing 25] It is drawing for explaining processing of the foreground are recording image configuration section 43 of drawing 24 .
[Drawing 26] It is the block diagram showing the example of a configuration of the

study section 45 of drawing 24 .

[Drawing 27] It is the block diagram showing the example of a configuration of the adaptation processing section 47 of drawing 24 .

[Drawing 28] It is a flow chart for explaining the detail of processing (foreground coding processing) of the foreground coding section 16 of drawing 24 .

[Drawing 29] A prediction tap is drawing showing signs that it is constituted using an error image.

[Drawing 30] A prediction tap is drawing showing signs that it is constituted using the error image of two sheets.

[Drawing 31] It is the block diagram showing the example of a configuration of the decoder 2 of drawing 1 .

[Drawing 32] It is a flow chart for explaining processing (decode processing) of the decoder 2 of drawing 31 .

[Drawing 33] It is drawing for explaining the medium which applied this invention.

[Drawing 34] It is the block diagram showing the example of a configuration of the computer 101 of drawing 33 .

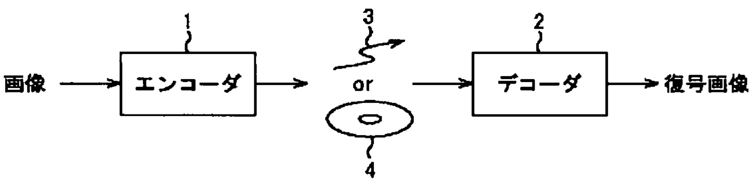
[Description of Notations]

1 Encoder 2 Decoder, 3 Transmission medium 4 A record medium, 11 are-recording section 12 A camera motion detecting element, 13 The camera motion vector storage section and 14 background extract section 15 Background memory, 16 Foreground coding section 17 MUX, 21 Center-of-gravity calculation section 22 A vector detecting element, 23 A write-in control section, 24 An are recording image memory, 25 Motion-less judgment section 31 An existence range detecting element, 32 Read-out section 33 Frequency count area 34 The frequency table storage section and 35 The write-in section 36 Background flag memory 41 The foreground extract section, 42 foreground storage section 43 The foreground are recording image configuration section, 44 foreground are recording image storage section, 45 The study section, 46 Prediction coefficient storage section 47 The adaptation processing section, 48 Error count section 49 The error image storage section, 50 Error judging section 51 MUX, 61 prediction tap configuration section 62 The normal equation configuration section, 63 The prediction coefficient calculation section, 71 The prediction tap configuration section, 72 Prediction operation part 81 DMUX, 82 Prediction coefficient storage section 83 The adaptation processing section, 84 Foreground storage section 85 The synthetic section, 86 image storage section 87 Background memory 88 The camera motion vector storage section, 101 Computer 102 Hard disk 103 Semiconductor memory, 111 Floppy disk 112 CD-ROM, 113 An MO

disk, 114 DVD, 115 Magnetic disk 116 Semiconductor memory, 121 download site 122 satellites, 131 Network 141 buses 142 CPU 143 ROM 144 RAM 145 Input/output interface 146 Display 147 Input section 148 Communications department 149 Drive

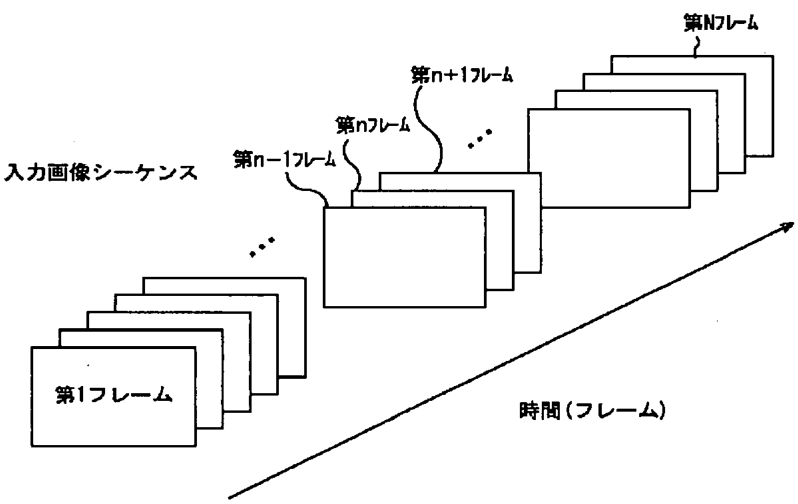
DRAWINGS

[Drawing 1]

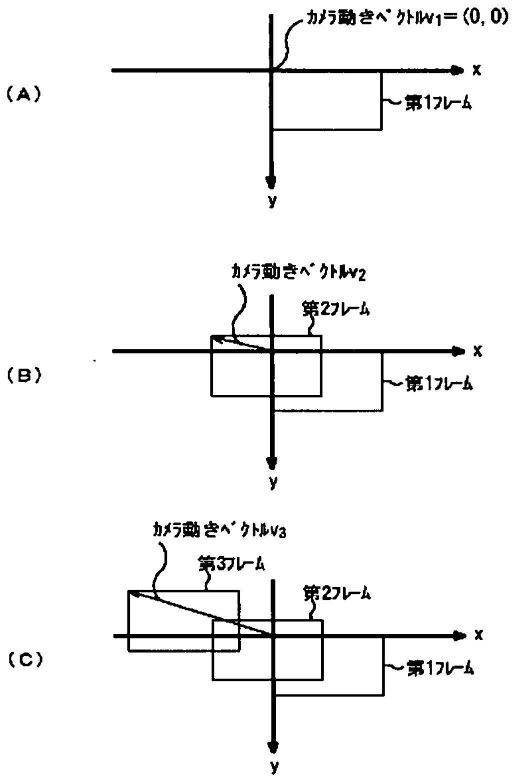


画像伝送装置

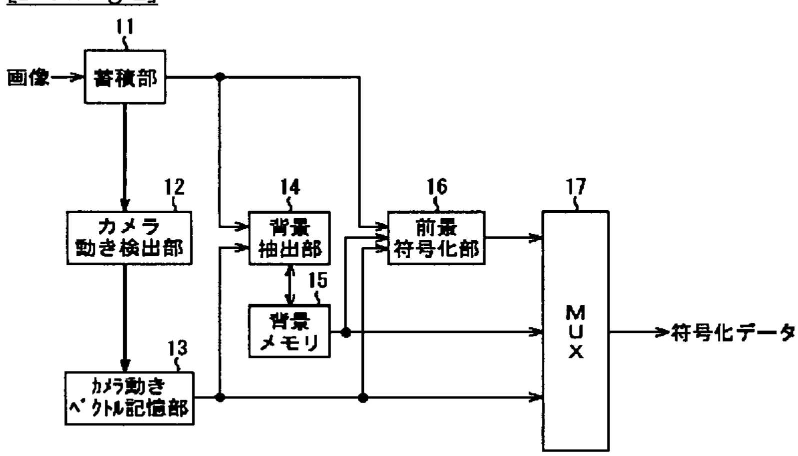
[Drawing 3]



[Drawing 4]

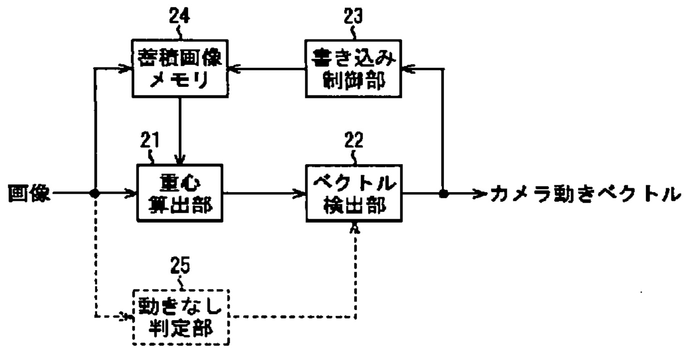


[Drawing 2]



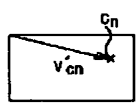
エンコーダ 1

[Drawing 5]

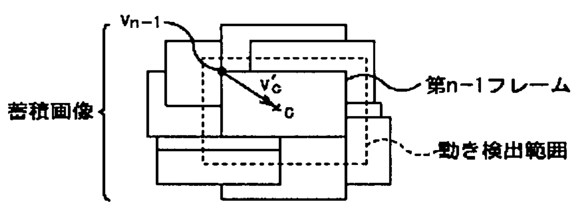


カメラ動き検出部 12

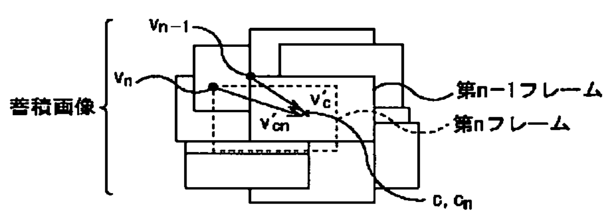
[Drawing 6]



（A） 注目フレーム（第nフレーム）の重心c_n



（B） 動き検出範囲の重心c



（C） 注目フレーム（第nフレーム）の
カメラ動きベクトルv_n（$=v_{n-1}+v'_c-v'_{cn}$）

[Drawing 9]

画素値のレベル	度数f_k	Σx_k, Σy_k
レベルK		
⋮	⋮	⋮
レベル3		
レベル2		
レベル1		

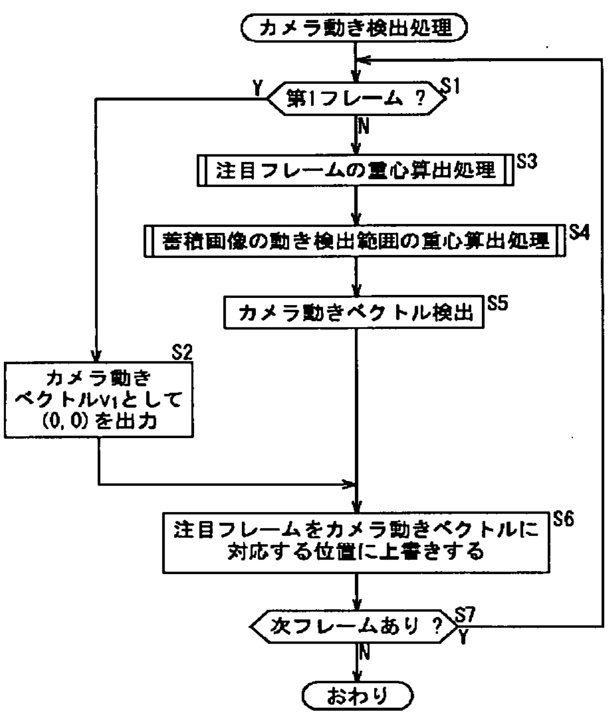
レベルテーブル

[Drawing 12]

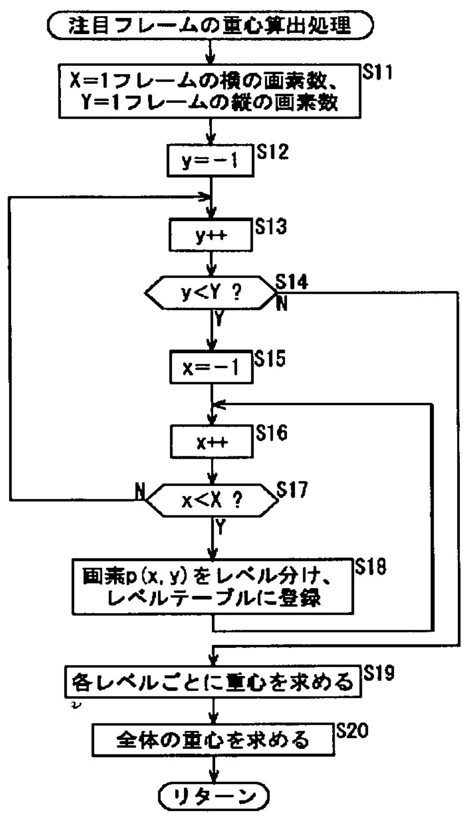
輝度	度数f_k	Σx_k, Σy_k
クラスK		
⋮	⋮	⋮
クラス3		
クラス2		
クラス1		

クラステーブル

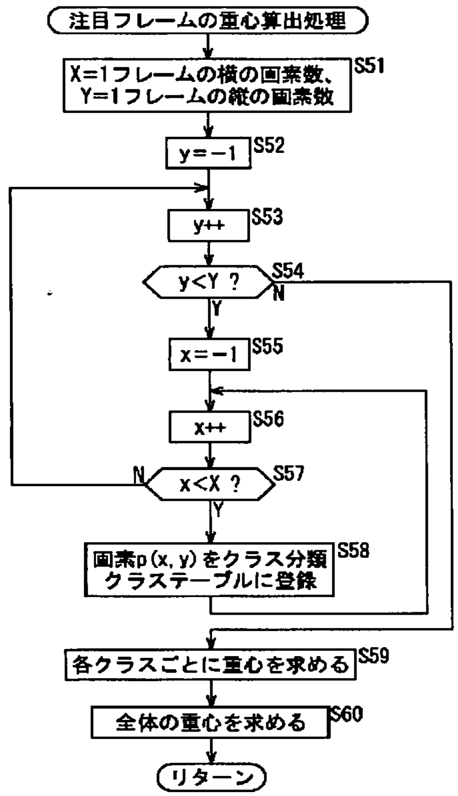
[Drawing 7]



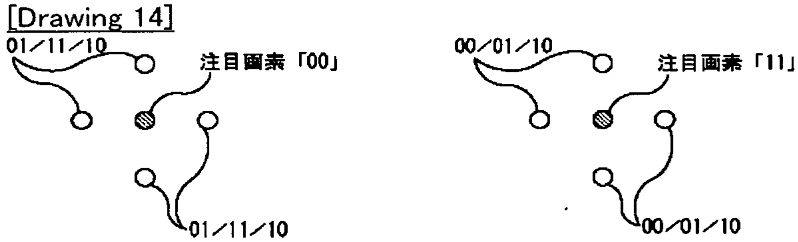
[Drawing 8]



[Drawing 11]

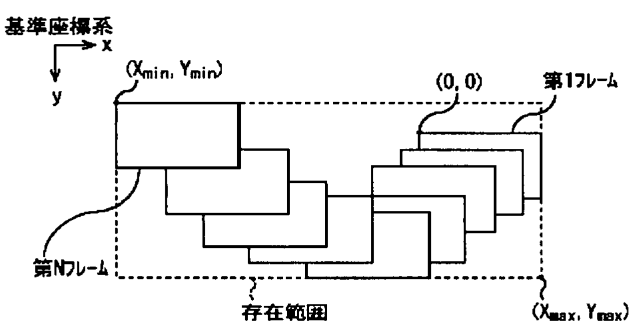


[Drawing 14]

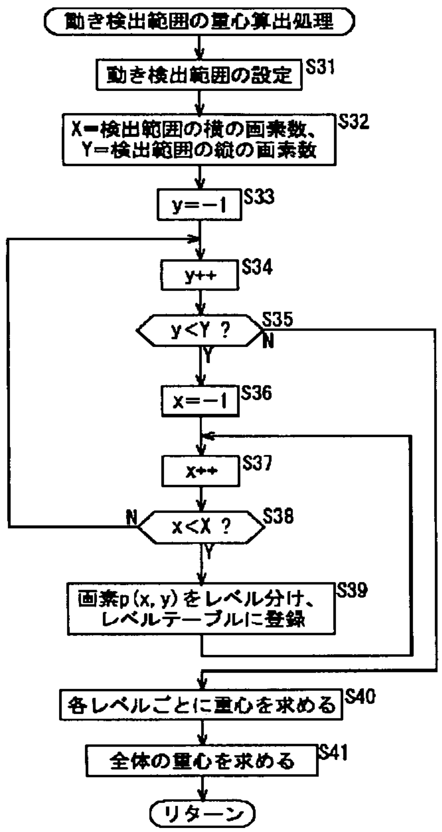


（A）注目画素が「00」の場合　（B）注目画素が「11」の場合

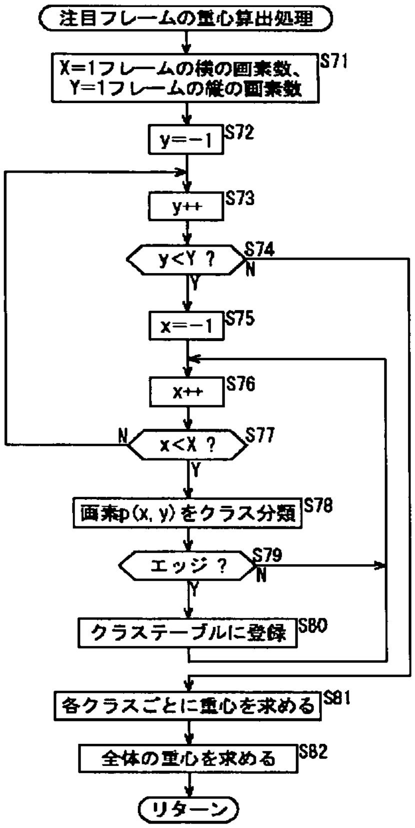
[Drawing 17]



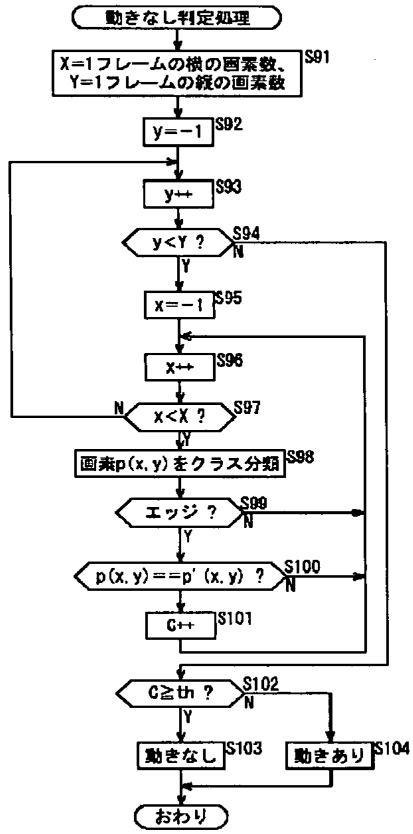
[Drawing 10]



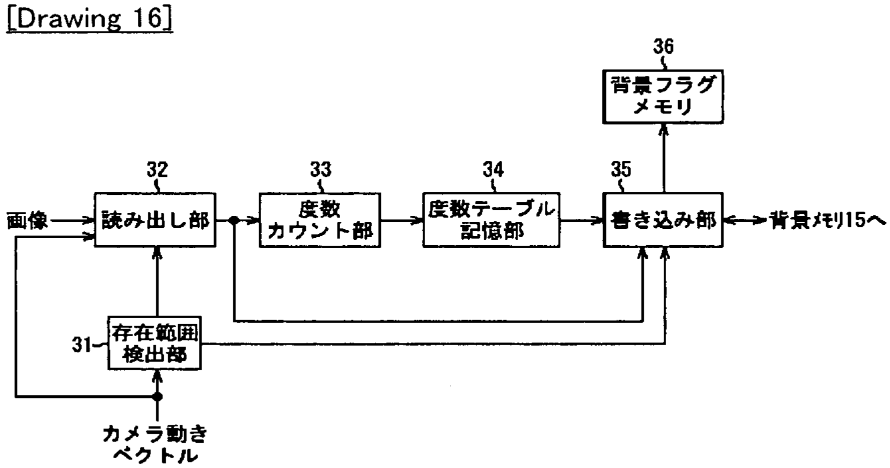
[Drawing 13]


注目フレームの重心算出処理
X=1フレームの横の画素数、
Y=1フレームの縦の画素数
S71
y=−1
S72
y++
S73
y<Y ?
S74
N
Y
x=−1
S75
x++
S76
x<X ?
S77
N
Y
画素p(x, y)をクラス分類
S78
エッジ ?
S79
N
Y
クラステーブルに登録
S80
各クラスごとに重心を求める
S81
全体の重心を求める
S82
リターン

[Drawing 15]

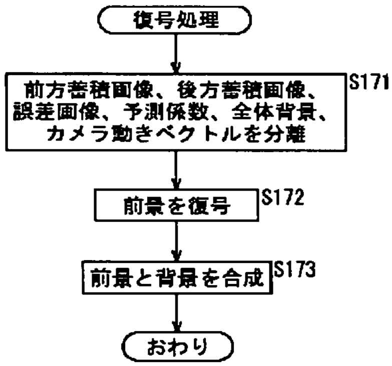


[Drawing 16]

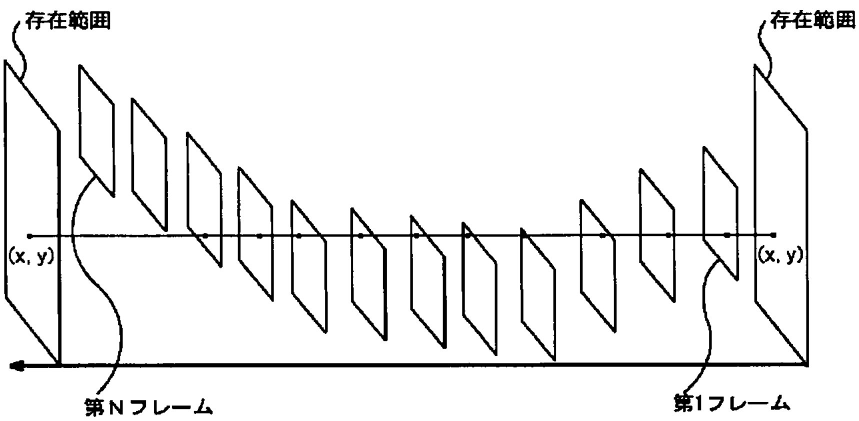


背景抽出部 14

[Drawing 32]



[Drawing 18]

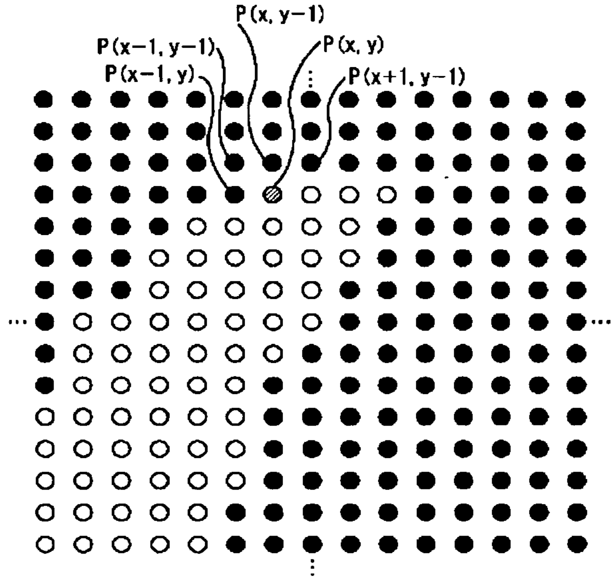


[Drawing 19]

座標	第1度数ﾚﾍﾞﾙ	割合	第2度数ﾚﾍﾞﾙ	割合	…	第M度数ﾚﾍﾞﾙ	割合
X_{min}, Y_{min}					…		
…					…		
0, 0					…		
0, 1					…		
…					…		
X_{max}, Y_{max}					…		

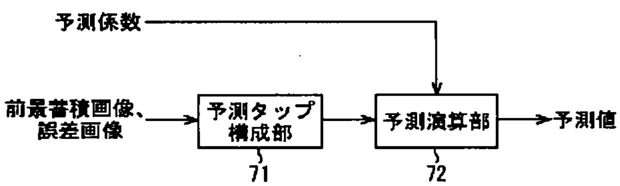
度数テーブル

[Drawing 23]



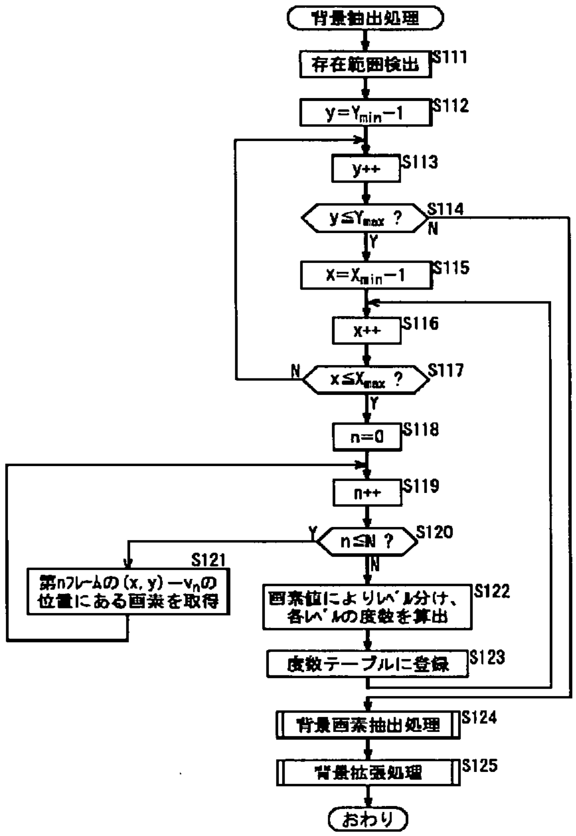
背景拡張処理

[Drawing 27]

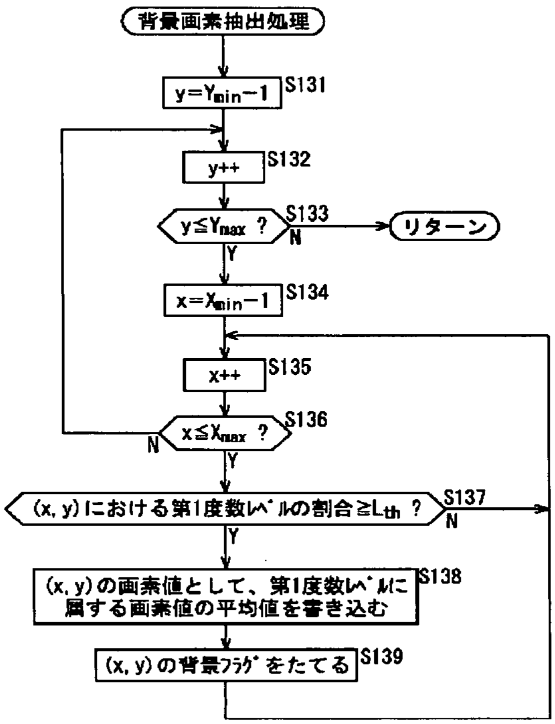


適応処理部 47

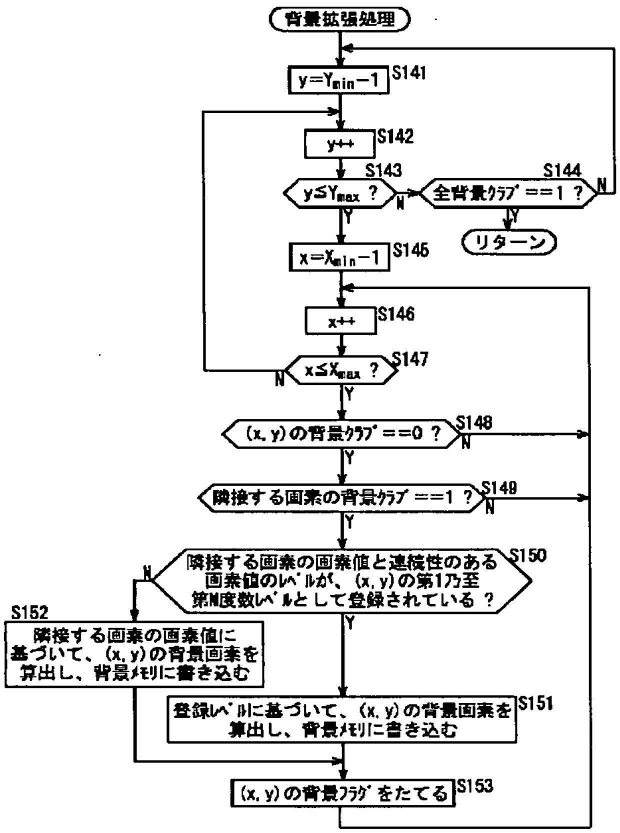
[Drawing 20]


背景抽出処理
存在範囲検出
S111
y=Ymin−1
S112
y++
S113
y≦Ymax ?
S114
N
Y
x=Xmin−1
S115
x++
S116
N
x≦Xmax ?
S117
Y
n=0
S118
n++
S119
Y
n≦N ?
S120
N
S121
第nフレームの(x, y)−vnの
位置にある画素を取得
画素値によりレベル分け、
各レベルの度数を算出
S122
度数テーブルに登録
S123
背景画素抽出処理
S124
背景拡張処理
S125
おわり

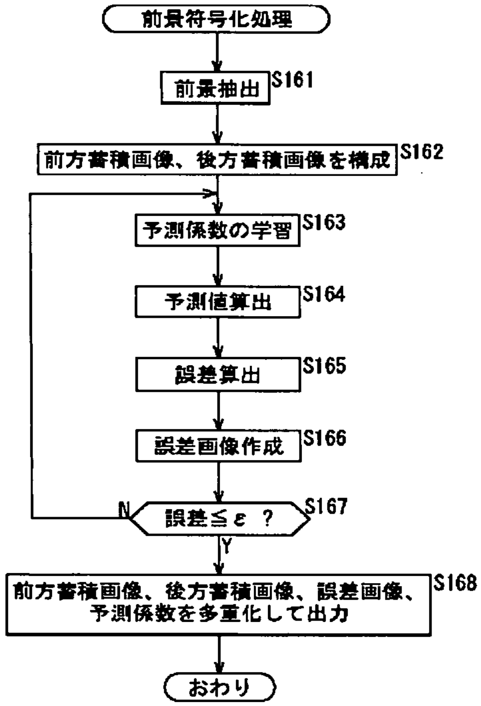
[Drawing 21]


背景画素抽出処理
y=Ymin−1
S131
y++
S132
y≦Ymax ?
S133
N
リターン
Y
x=Xmin−1
S134
x++
S135
x≦Xmax ?
S136
N
Y
(x, y)における第1度数レベルの割合≧Lth ?
S137
N
Y
(x, y)の画素値として、第1度数レベルに属する画素値の平均値を書き込む
S138
(x, y)の背景フラグをたてる
S139

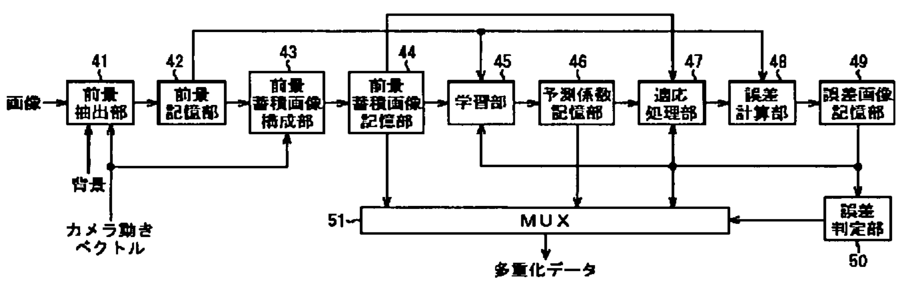
[Drawing 22]


背景拡張処理
y=Ymin−1
S141
y++
S142
S143
y≦Ymax ?
S144
全背景ﾌﾗｸﾞ==1 ?
リターン
x=Xmin−1
S145
x++
S146
x≦Xmax ?
S147
(x, y)の背景ﾌﾗｸﾞ==0 ?
S148
隣接する画素の背景ﾌﾗｸﾞ==1 ?
S149
隣接する画素の画素値と連続性のある画素値のﾚﾍﾞﾙが、(x, y)の第1乃至第N度数ﾚﾍﾞﾙとして登録されている ?
S150
S152
隣接する画素の画素値に基づいて、(x, y)の背景画素を算出し、背景ﾒﾓﾘに書き込む
登録ﾚﾍﾞﾙに基づいて、(x, y)の背景画素を算出し、背景ﾒﾓﾘに書き込む
S151
(x, y)の背景ﾌﾗｸﾞをたてる
S153
Y
N

[Drawing 28]

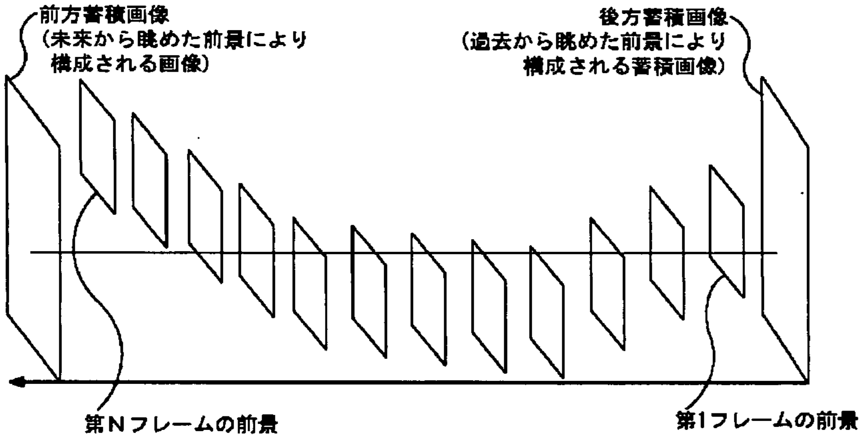


[Drawing 24]

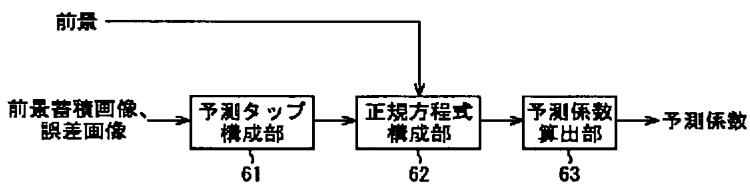


前景符号化部 16

[Drawing 25]

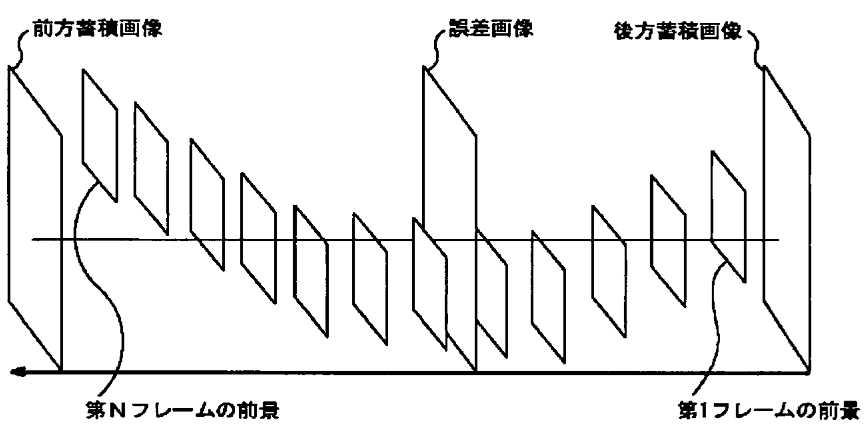


[Drawing 26]

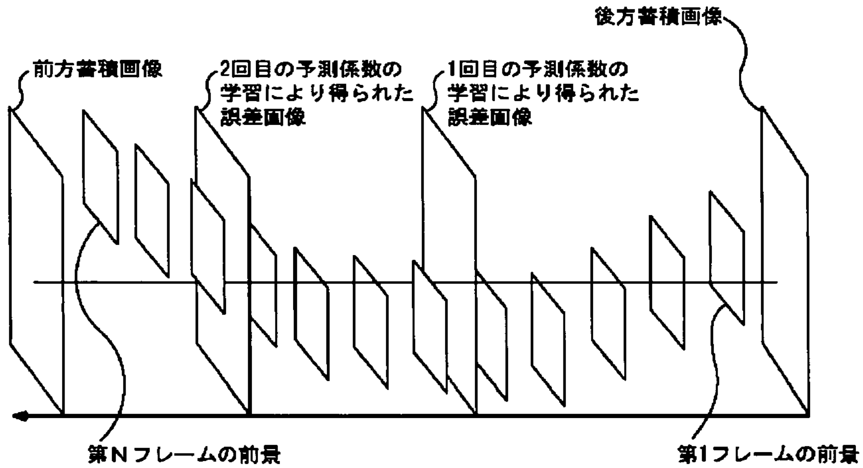


学習部 45

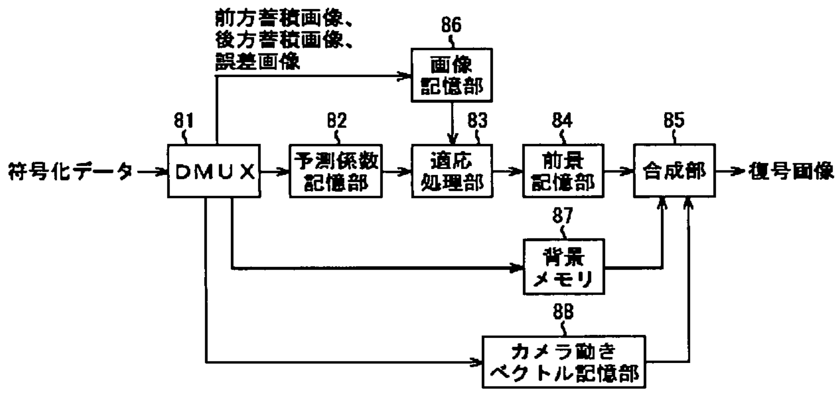
[Drawing 29]



[Drawing 30]

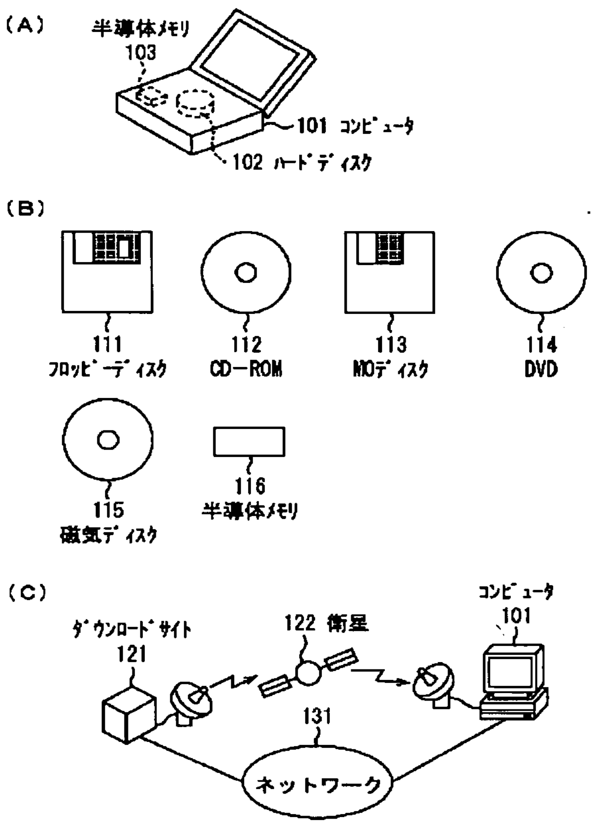


[Drawing 31]

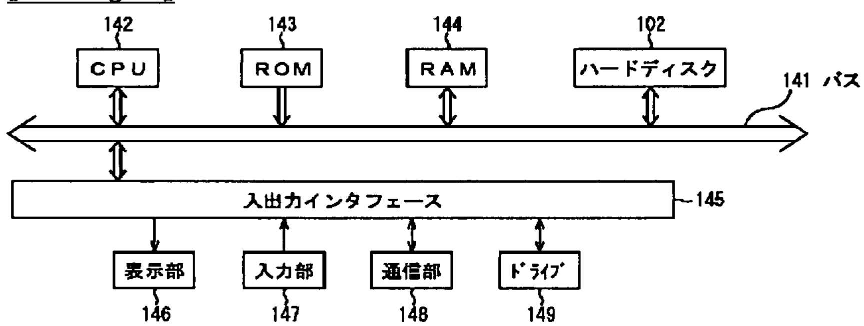


デコーダ 2

[Drawing 33]



[Drawing 34]



コンピュータ 101